Five-Year Review Report

for

Duell & Gardner Landfill Site
Dalton Township
Muskegon County, Michigan

September 2005

PREPARED BY:

United States Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by:

Richard C. Karl, Director
Superfund Division
U.S. EPA

Date:

9/2/05

Five-Year Review Report

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List of Acronyms

ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CIC	Community Involvement Coordinator
CVA	Carbon Vapor Adsorption
EPA	Environmental Protection Agency
GSI	Groundwater/Surface Water Interface
MCDH	Muskegon County Health Department
MCL	Maximum Contaminant Level
MCPA	4-chloro-methylphenoxy acetic acid
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDPH	Michigan Department of Public Health
mg/kg	Milligram Per Kilogram
NCP	National Contingency Plan
NPL	National Priorities List
PCB	Polychlorinated Biphenyls
ppb	Parts Per Billion
ppm	Parts Per Million
PRP	Potentially Responsible Party
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Chemical
TCL	Target Concentration Limits
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Chemical

Executive Summary

The remedy for the Duell & Gardner Landfill Site located in Dalton Township, Muskegon County, Michigan included the following components:

- **Removal of hot spot area soils and consolidation of media from within the 8 acre waste area into a 4 acre landfill;**

- **Construction of a landfill cap to minimize surface water infiltrating into the consolidated waste area;**

- **Continued operation of the existing groundwater recovery and treatment system;**

- **Impose institutional controls, such as a restrictive covenant to prohibit the installation of water wells in the site area, prohibit interference with landfill cap and limit any future development that might disturb contaminated soils; and,**

- **Implement a groundwater monitoring program capable of demonstrating the effectiveness of the groundwater capture system and that the groundwater treatment technology is achieving the cleanup standards.**

The site achieved construction completion with the signing of the Preliminary Closeout Report on August 10, 2001. The trigger action for this five-year review was the remedial action start date September 29, 2000.

The remedy at the Duell & Gardner Landfill Site currently protects human health and the environment because impacted soils have been removed, wastes have been consolidated into a 4-acre landfill and covered with an impermeable cover, and impacted groundwater is currently being recovered and treated on site. However, in order for the remedy to be protective in the long-term, institutional controls need to be put in place to prevent exposure to contaminated groundwater and soils.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Duell & Gardner Landfill Site

EPA ID *(from WasteLAN)*: *MID* 980504716

Region: 5	**State:** MI	**City/County:** Muskegon, Muskegon County

SITE STATUS

NPL status: X Final ☐ Deleted ☐ Other (specify) _____

Remediation status (choose all that apply): ☐ Under Construction X Operating ☐ Complete

Multiple OUs?* ☐ YES X NO	**Construction completion date:** 08/10/2001

Has site been put into reuse? ☐ YES x NO

REVIEW STATUS

Lead agency: X EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Pamela J. Molitor

Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA

Review period:** 03/15/2005 to 9/29/2005

Date(s) of site inspection: 06/21/2005

Type of review:

X Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: X 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering action:

X Actual RA Onsite Construction at OU #_1_ ☐ Actual RA Start at OU#____
☐ Construction Completion ☐ Previous Five-Year Review Report
☐ Other (specify) _____

Triggering action date *(from WasteLAN)*: 09/29/2000

Due date *(five years after triggering action date)*: 09/29/2005

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

1) Need to complete an IC Implementation Plan;
2) Recovery well RW 4 should be brought online;
3) The Landfill Monitoring Plan should be updated and finalized; and
4) Determine need for additional residential well sampling

Recommendations and Follow-up Actions:

1) U.S. EPA will contact the owners of the parcels to get the required restrictive covenant fully in place and complete IC Implementation Plan in 6 months;
2) U.S. EPA and its contractors will bring online recovery well RW-4;
3) The Landfill Monitoring Plan will be updated and finalized; and
4) MDEQ will contact Muskegon County Health Department to request that the county perform residential well sampling.

Protectiveness Statement:

The remedy at the Duell & Gardner Landfill Site currently protects human health and the environment because impacted soils have been removed, wastes have been consolidated into a 4 acre landfill and covered with an impermeable cover, and impacted groundwater is currently being recovered and treated on site. However, in order for the remedy to be protective in the long-term, institutional controls need to be put in place to prevent exposure to contaminated groundwater and soils.

Other Comments:

None

Five-Year Review Report

I. Introduction

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this five-year review pursuant to the CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (U.S. EPA) Region 5 has conducted a five-year review of the remedial actions implemented at the Duell & Gardner Site located in Dalton Township, Muskegon County, Michigan. This review was conducted by the Remedial Project Manager (RPM) from April 1, 2005 through September 29, 2005. This report documents the results of the review.

This is the first five-year review for the Duell and Gardner Landfill Site.. The triggering action for this statutory review is the construction start to the soil remedy component as shown in U.S. EPA's WasteLAN database: September 29, 2000. This review is required because certain response actions are ongoing and hazardous substances, pollutants, or contaminants are or will be left on site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
Operated as Municipal Waste Landfill	**1940-1973**
MDPH ordered landfill closed	**January 1, 1974**
Site Discovery	**1977**
MDNR discovers PCBs in soil	**1979**
EPA installs four monitoring wells	**1982**
NPL listing	**September 8, 1983**
MDNR and EPA identify and sample drum and waste areas at site	**1984 - 1985**
EPA conducts Removal Action at site	**March 1986**
Remedial Investigation/Feasibility Study	**November 1986 - March 1992**
ROD signature	**September 7, 1993**
Remedial Design Start	**July 1994**
EPA On site construction start	**September 29, 2000**
ROD Amendment signature	**June 29, 2001**
Construction Completion Date	**August 10, 2001**
First Five-Year Review	**September 29, 2005**

III. Background

Site Characteristics

The Duell & Gardner Landfill is located approximately five miles north of the city of Muskegon, Michigan. The site is comprised of an 80 acre parcel located at 1285 Bard Road, Dalton Township, Muskegon County, Michigan. The landfill itself consisted mostly of municipal debris that had been spread out over a surface area of approximately 8-acres. The site is not fenced; however the landfill area is secluded and posted with warning signs indicating that this is a hazardous waste site.

Land and Resource Use

The Site is situated in a primarily residential and agricultural area. Approximately 140 people live within a one mile radius and 1,200 people live within a two mile radius of the site. There are two residences, single family homes, and an agricultural field located on the northern half of the property (see Attachment 1). The landfill occupies the southern half of the site. The topography of the site is flat to gently rolling with a topographic relief of approximately 21 feet.

The business or industry in the vicinity of the site include an auto salvage yard just northeast of the site, a campground 1.5 miles west of the site, a golf course 1.5 miles south of the site, and several small businesses and chemical companies located two miles or more from the site in Dalton Township.

The site geology is characterized by glacial deposits approximately 300 feet thick consisting predominantly of very fine to medium grained sand. The underlying bedrock is sandstone of the Marshall formation. One unconfined aquifer has been identified at the site. The water table was encountered between three to sixteen feet below ground level. Groundwater flow beneath the site is generally to the south-southeast toward Bear Creek which is approximately 1.5 miles from the site (see Attachment 2).

Water supplies in the area are derived from wells in the glacial deposits or from Lake Michigan. The bedrock aquifer is apparently not utilized as a drinking water source in Dalton Township. Two residential drinking water wells are located on the northern half of the site upgradient of the contaminant plumes. Approximately 21 private wells are located within three quarters of a mile to the south and southeast of the site. The depths of the residential wells in the area are primarily between 25 and 40 feet below ground level.

History of Contamination

The landfill was used for the disposal of wastes from the mid 1940s to 1973. During the 1940s to 1969, municipal and industrial wastes were deposited in trenches, depressions and on the surface of the site. The site was operated as a solid waste disposal facility from 1969 to 1973. During

this time, wastes including liquid wastes were being disposed of in unlined trenches excavated at the site. The site was periodically inspected by the Muskegon County Health Department from 1969 through September 1973. In 1973 the MCHD noted that liquid wastes were being disposed in the landfill. MDPH ordered the landfill closed in January 1974 after which, the landfill ceased accepting wastes.

Initial Response and Basis for Taking Action

Initial concern regarding the possible contamination of groundwater at the Duell & Gardner Landfill Site arose when the MDPH was considering approval for the construction of a community water supply in the area in December 1977. In 1979, MDNR collected soil and drum samples which indicated that PCBs were present in the soil. US EPA collected surface water samples in 1981. In 1982, US EPA installed four monitoring wells and determined that the groundwater was flowing in a southeasterly direction. No significant concentrations of organic or inorganic compounds were detected in these wells. In 1984, the MDNR and US EPA located and sampled drums in a wooded area adjacent to the landfill. The analysis of these samples showed evidence of organic and inorganic contamination.

MDNR identified 21 distinct drum and waste areas at the site in September 1985. Approximately 550 drums in various stages of deterioration were found scattered in the woods adjacent to the landfill in groups of 9 to 140 drums. Hundreds of small laboratory bottles, areas of refuse and debris, and piles of unidentified sludge-like material were scattered around the base of the landfill. In March 1986, under a CERCLA removal action, the US EPA removed 550 drums in various stages of deterioration, some laboratory bottles, sludge-like material, and some soil from the site.

In December 1982, the property was proposed for inclusion on the National Priorities List (NPL) and finalized on the list in 1987.

Soils

Twenty-one locations with at least one organic compound were identified in on-site soils. The primary contaminants found in the soils included bis(2-ethylhexy)phthalate, crystal violet, aniline, and N,N-Dimethylaniline. PCBs and pesticides (DDT, DDD, and DDE) were found in the soils at two locations. Crystal Violet was detected at up to 188 parts per million (ppm).

Groundwater

US EPA installed four monitoring wells in 1982 and determined that the groundwater flows beneath the site in a south-southeasterly direction. Two groundwater plumes were emanating from the site. Groundwater contaminants included chloroform and carbon tetrachloride in one plume, and aniline and N,N-Dimethylaniline in the other plume. Chloroform and carbon tetrachloride were found only in the shallow portion of the aquifer (ten to twenty feet below the ground surface) while aniline

and N,N-Dimethylaniline were also found in deeper portions of the aquifer (up to 100 feet).

Several residential wells are located approximately one half mile to the south and east of the site along McMillian and Pillon roads. Twenty-one private wells located within this area were sampled during the investigations and were found not to be contaminated by the site.

Surface Water/Sediment

Surface water and sediment samples were collected from the tributary to Bear Creek located east of the site and sediment samples were collected from the drainage ditch south of the site. Neither of these drainage systems were contaminated by the site.

In November 1986, a remedial investigation/feasibility study (RI/FS) was initiated to quantify the residual contamination at the site and to identify appropriate remedial alternatives. The RI/FS was a state lead activity funded with federal Superfund money. The RI field work began in December 1986 and continued through August 1990.

A Treatability Study was conducted to identify technologies which might eliminate or reduce the toxicity, mobility, and /or volume of the contaminants present in site soil and groundwater. The Treatability Study was conducted from November 1990 through March 1991. Both the Treatablility Study report and the RI report were completed in March 1992. The FS report was completed in August 1992.

IV. Remedial Actions

Remedy Selection

Based on the findings of the RI and Baseline Risk Assessment, a Feasibility Study (FS) was conducted to identify and evaluate different cleanup options. The FS was completed in August 1992. The U.S. EPA then issued a proposed plan in April 1993, and signed a Record of Decision on September 7, 1993 that called for the following actions:

- Excavation of contaminated soil and on-site treatment using low temperature thermal desorption (LTTD)

- Construction of a clay cap to properly cover the old landfill area

- Extraction of groundwater to capture and halt the flow of the contaminated plume and removal of contaminants from the ground water by carbon adsorption.

- Groundwater monitoring to assess the state of remediation; and

- Placement of deed restrictions to prevent installation of drinking water wells in the

affected area of the site during remediation.

Unilateral Administrative Order

US EPA issued a Unilateral Administrative Order (UAO) for performance of remedial design (RD) and remedial action (RA) at the site to the Potentially Responsible Party (PRP) in June 1994. On July 29, 1994, the PRP agreed to comply with the UAO, until it received a favorable legal decision on the issue of its underlying liability at the site. On September 10, 1997, the PRP submitted a letter to the US EPA indicating its intent to cease work under the UAO within 30 days. In October 1997, the PRP ceased work at the site. The state and federal government were unable to prove their case at law against the PRP. The parties resolved the case in a July 1999 Order and Consent Decree. The US EPA and MDNR took over the remaining clean up of the site.

ROD Amendment

The ROD amendment was signed on June 29, 2001 and issued to reflect new post-ROD information obtained during the 1996 Pre-Design Investigation.

The 1993 ROD determined that additional studies were necessary to determine the full extent of groundwater and soil contamination prior to the actual designing of the groundwater treatment system. Consequently, pre-design fieldwork was conducted to:

- Further delineate the extent of soil contamination;
- Characterize a potential source area for the carbon tetrachloride/chloroform plume;
- Define the horizontal and vertical extent of groundwater contamination; and
- Determine the depth to an aquitard or bedrock at the site.

The 1996 Pre-Design Investigation report recommended that the US EPA and MDEQ consider changes to the selected remedy. The Pre-Design Investigation report indicated that the extent of contamination in the soil and groundwater was less than previously identified, and the size and mass of the groundwater plumes appeared to have stabilized or decreased since the RI. In addition, the State of Michigan revised its cleanup levels, which resulted in a reduction in the volume of soil requiring remediation at the site. It would therefore be a more cost effective method of remediation to dispose of the soil at an appropriate landfill.

A Proposed Plan was released for public comment in September 1999. However, during the time between the end of the public comment period and completion of the ROD Amendment, additional pre-design activities were conducted to perform a baseline study to better understand the groundwater plume. This study cast doubt on whether the natural degradation of contaminants in the groundwater would occur prior to the plume migrating off-site. Because of concerns that groundwater contamination could migrate off-site and concerns about the ability to reliably restrict the use of the contaminated groundwater that might migrate beyond the property boundary, it was decided that the groundwater portion of the 1993 ROD should not be amended, and a groundwater extraction and

treatment system by carbon adsorption should remain as part of the selected remedy. The preliminary groundwater modeling envisioned that groundwater clean-up goals could be achieved in one to five years, less time than long-term monitoring would take.

The amended ROD retained the placement of use restrictions or institutional controls on appropriate parts of the site to prevent the installation of groundwater wells for drinking water purposes until the appropriate groundwater cleanup standards (residential) are met.

Remedy Implementation

Remedial Actions

Landfill Cap

From past investigations, twenty one locations with at least one organic compound were identified over Michigan Part 201 cleanup criteria for onsite soils. The areas of soil contamination were generally small, isolated zones corresponding to areas where contamination may have leaked or spilled from drums located at the surface. Most of the wastes were of the municipal type and extended over 8-acres of land.

The United States Army Corps of Engineers (USACE) completed the remedial design for the landfill site on behalf of the US EPA between June and September 2000. MDEQ and US EPA worked on planning review and oversight for the design. The USACE and their contractor, the IT Corporation, completed construction of the cap between October 2000 and April 2001. The main purpose of the landfill cap is to protect human health from landfill media contamination.

Site strategies were developed by USACE to determine the viability of consolidating the 8-acre kidney shaped waste area into a 4-acre rectangular area and to transfer waste debris from areas outside the 8-acre landfill to within the 4-acre landfill area. Those strategies included:

- Tree Removal, Clearing and Grubbing;
- Landfill Boundary Verification;
- Baseline Survey;
- Debris Transfer from MW-13, MW-14 to Landfill;
- Investigative Derived Waste Transfer to Landfill;
- Hot Spot Removal, Characterization, and Confirmation Testing;
- Landfill Consolidation, Southeast Quadrant, Western Area;
- Compaction and Preparatory Grading;
- Cap Construction; and,
- Site Restoration.

Collected data was provided to US EPA, MDEQ, USACE, and IT and resulted in the decision to construct a 4-acre landfill cap, which commenced in October 2000 and was substantially complete

in December 2000. Due to inclement weather in December 2000, final grading, hydroseeding, and site restoration was completed in Spring 2001. During the course of these activities, several site discoveries were made.

- While performing Landfill Boundary Verification activities, approximately 2000 cubic yards of gentian violet impacted soils were identified just inside the northern and southern boundary of the 4-acre landfill footprint. These waste soils were exhumed, sampled and analyzed, and confirmation samples were collected. Through subsequent discussions with the US EPA and MDEQ, a design for a special waste cell within the cap was developed and submitted. MDEQ approved the cell design and agreed to transfer of gentian violet impacted wastes within it. Confirmation samples were collected from the excavation surfaces, analyses did not show regulatory exceedences for gentian violet.

- After transferring wastes from a southwestern section of the 8-acre waste area, confirmation samples were collected, consistent with the chemistry scope of work. The analyses showed 4-chloro-methylphenoxy acetic acid (MCPA), a systemic phenoxy herbicide used to control annual and perennial weeds, to be above Part 201 Residential Drinking Water Standards. However, additional soils were not removed due to the depth of the excavation, which was approximately 6 feet below ground surface (bgs), the depth to groundwater. Additional excavation would not further reduce the source of MCPA contamination in groundwater.

- The hot spots, namely impacted soils in areas of soil sample locations SL-A8, SL-SB-11, and SS-31, were removed, staged, sampled and analyzed. The resultant stockpiles were sampled and analyzed, the results did not meet the definition of hazardous waste. Based on the results and discussions between USEPA, MDEQ, USACE, and IT, the staged wastes were disposed of in the landfill. The ROD was amended to account for this change.

Tree stumps were ground and spread along with stock piled wood chips between November 7, 2000 and January 4, 2001. Laboratory analysis of several samples of the ground tree stumps and the wood chips indicated that the materials were free from contaminants.

Groundwater Extraction/Treatment System

Design of the interim groundwater treatment system began with an aquifer test on July 26, 2000. A submersible well pump, powered by a generator, was placed in Test Well 1 (TW-1 now RW-1) and used to convey 150 gallons per minute (gpm) of untreated groundwater into a 50,000 gallon pool. A six inch diesel powered centrifugal pump conveyed untreated water from the pool through a manifold system of six Granular Activated Carbon (GAC) units and into another 50,000 gallon pool. Another six inch diesel powered centrifugal pump conveyed treated groundwater to the infiltration gallery, located approximately 1500 feet away. The infiltration capacity of the gallery was greater than the 150 gpm flow rate for the duration of the test. Approximately 432,000 gallons of water were

recovered, treated, and discharged before the end of the test on July 28, 2000. Data collected during the test was used as the design basis for the final groundwater treatment system.

On April 23, 2001, U.S. EPA directed USACE to design and build a groundwater recovery system (see Attachment 3) with a life expectancy of 10 years. In response to this request, USACE designed and constructed a system consisting of four recovery wells, an infiltration gallery, a treatment building containing two granular activated carbon units (GAC), various pumps, a 3,000 gallon retention tank, conveyance piping, appurtenant devices, and automatic shut down capabilities.

Design of the groundwater treatment system began with the construction of a 24 foot by 24 foot insulated control building in the vicinity of recovery well 1 (RW-1 formerly TW1). The construction of the building occurred between May 28, 2001 and June 5, 2001.

Between June 14, 2001 and June 25, 2001, a 440 volt power and telephone line were set adjacent to the control building and the following groundwater treatment system components and services were installed:

- Two FP2 Calgon carbon units (each containing 2000 pounds of carbon);
- One 300 gallon polyethylene retention tank;
- One water table depression pump (installed in RW-1)
- One transfer pump;
- One control panel;
- Liquid level controls and pressure switches; and
- One telemetry autodialer system

Between June 25, 2001 and June 29, 2001, system startup and shakedown occurred. Following the shakedown period, the system was operated under normal conditions.

An infiltration gallery was installed using heavy equipment (D6 Dozers) between May 14, 2001 and May 25, 2001. The infiltration gallery was constructed 600 feet northwest of the landfill and approximately 450 feet south of the landowner's home (1285 East Bard Rd.).

Operation of the groundwater recovery and treatment system involved pumping of groundwater from recovery wells RW-1 and RW-4 at flow rates of between 30 to 40 gallons per minute. Influent water flowed through a pressure control switch, liquid pressure gauge, and two-inch galvanized pipes that were mounted on the north wall and ceiling. The water was treated through one GAC unit for each well and then discharged into a 3000 gallon storage tank with high and low level control switches. A transfer pump discharged treated water to the infiltration gallery.

This work was completed by July 11, 2001. Based on the feasibility study, submersible pumps were installed in Recovery Wells RW-1 and RW-4. Additional pumps were not installed in Recovery wells RW-2 and RW-3.

The groundwater treatment system began operation in July 2001. The USACE and its

contractor, Shaw Environmental, has operated and monitored the groundwater and recovery system since then. Following the initial startup, recovery well RW-1 was operated continuously, but the performance of the recovery system was affected by chemical properties of the groundwater. Recovery well RW-1 was creating biologic fouling through the treatment system. In attempts to control the fouling, Shaw added filters to pre-treat the water and implemented a well rehabilitation process involving well development and acid treatment of RW-1.

In 2003 , the treatment system was reconfigured to provide higher operating efficiency (see Attachment 4). The system was reconfigured as described below:

- The original GAC units for RW-1 and RW-4 were removed.
- Two new GAC units in series were incorporated into the system.
- Due to heavy fouling, two additional bag filters were added, for a total of four.
- The wells were chemically treated with acid on two occasions.
- The 3,000 gallon retention tank is now used for GAC backwashing.
- The original repressurization pump was replaced.
- A smaller volume pump was installed to pump the backwash water into the infiltration gallery.

In September 2004, US EPA and MDEQ reviewed the operation and maintenance report for 2003, in which USACE's contractor, Shaw Environmental, assessed the groundwater recovery system using computer models to evaluate the potential drawdown using different scenarios for wells RW-1 and RW-4 (see Attachment 5). Based on this evaluation, US EPA and MDEQ believed that system modification would more effectively capture the contaminant plume. This modification included installation of a new recovery well and operation of recovery well RW-4. Design and installation of a new recovery well would result in a higher capacity well which would capture the groundwater plume more effectively and efficiently. Modification of the recovery system began in March 2005 with expected completion in June 2005. This system modification is in keeping with the 2001 ROD Amendment remedy.

Institutional Controls

The 1993 ROD required that institutional controls, such as deed restrictions to prohibit the installation of water wells in the affected area until appropriate groundwater standards are met be placed on appropriate land parcels. The 2001 ROD Amendment retained this requirement. Water supplies in the area are derived from wells in the glacial deposit or from Lake Michigan. The bedrock aquifer is apparently not utilized as a drinking water source in Dalton Township. Two residential drinking water wells are located on the northern half of the site upgradient of the contaminant plumes. Approximately 21 private wells are located within three quarters of a mile to the south and southeast of the site.

Currently, efforts are under way to finalize a Restrictive Covenant at the site. The Site area is comprised of two parcels of property. Each of the parcels will be subject to the restrictive covenant placed on the property (Attachment 6), and require acknowledgment from the property owners that the restrictive covenant was placed on the properties. The owners of the parcels have received notice

of the need for a restrictive covenant. US EPA will conduct legal review of the Restrictive Covenant and acknowledgments of restrictions to determine whether they are sufficient. After which, the site property owners will record and file the documents with the State of Michigan, Muskegon County Register of Deeds.

Operation and Maintenance

Remedial Design and Remedial Action construction activities at the Site were conducted by US EPA and its contractors. The components of the remedial action were constructed by contractors and sub-contractors to US EPA. All design plans and field activities were reviewed and approved by US EPA, in consultation with MDEQ, to ensure consistency with the ROD, the RD/ RA work plans, and federal and state requirements.

The design and construction quality assurance/quality control (QA/QC) program utilized throughout the Remedial Design/Remedial Action (RD/RA) was in accordance with US EPA protocols. Details of the analytical procedures used to ensure the quality of work are contained in the approved Quality Assurance Project Plan (QAPP) sections of the Remedial Design/Remedial Action Work Plan. The QA/QC program utilized has been sufficient to allow US EPA to make the determination that all reported materials specifications are adequate and construction methods used allowed remedy construction to be satisfactorily performed in accordance with the ROD. The groundwater/surface water monitoring activities have been conducted in accordance with the approved QAPP.

Monitoring Program

Groundwater recovery and treatment will continue to operate until monitoring demonstrates that the groundwater cleanup standards have been attained. As part of the requirements of the 2001 ROD Amendment, the US EPA contractor has been performing quarterly groundwater monitoring of selected wells. That monitoring continues today. US EPA, in consultation with the MDEQ, will certify completion of the groundwater remediation activities once it has been determined that cleanup levels have been attained and maintained for all chemicals of concern listed in the ROD.

During operation, the treatment system (recovery well influent, GAC intermediate and effluent) also requires periodic monitoring.

V. Five-Year Review Process

Administrative Components

The Duell & Gardner Landfill Site Five-Year Review was led by Pamela Molitor of the U.S. EPA, Remedial Project Manager for the Site and Robert Paulson, Community Involvement Coordinator. Wally Wagaw of the MDEQ, assisted in the review as the representative for the support agency.

The review, which began on April 1, 2005, consisted of the following components:

1) Community Involvement;
2) Document Review;
3) Data Review;
4) Site Inspection; and,
5) Five-Year Review Report Development and Review.

Community Involvement

Activities to involve the community in the five-year review were initiated with communication in early 2005 between the RPM and the Community Involvement Coordinator (CIC) for the Site. A notice was sent to the *Muskegon Chronicle* that a five-year review was to be conducted. The notice was published on May 25, 2005 and invited the public to submit any comments to US EPA. The results of the review and the report were made available at the Dalton Township Hall, Superfund Site information repository. No public comments were received during the five-year review comment period.

Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (See Attachment 7). Applicable soil and groundwater cleanup standards, as listed in the ROD were also reviewed (See Attachment 8).

Data Review

The April 2005 Groundwater Monitoring Report, the December 2004 Groundwater Report, and the 2003 Operation and Maintenance Report provide a comprehensive analysis of the current groundwater contamination at the Site, along with water quality trends in contaminant concentrations.

Attachment 9 is a table presenting the analytical results from the first quarter of groundwater sampling in 2005. Attachment 2 is a groundwater flow map for the Site. Attachment 10 contains figures depicting the plume contours using data from 2004 and 2005. The following are the conclusions reached in the 2003 Operations and Maintenance Report and are further supported by data from the most recent 2005 sampling event.

1) The groundwater continues to flow in a southeasterly direction which is consistent with historical directions of flow for the site;
2) The construction of recovery well RW-1 is the likely cause of the biologic fouling;
3) Comparison of water level measurements indicates that the difference in water levels appears to decrease with increasing distance from RW-1. Based on these observations, water level elevations have been affected by the operation of the groundwater extraction system;
4) Evaluation of the groundwater recovery system was performed using computer modeling and it was determined that the groundwater recovery system may not be effectively capturing the groundwater plumes. This assessment resulted in modification of the system in 2005 to include the start up of recovery well RW-4 and

installation of a new recovery well;

5) Chloroform, carbon tetrachloride, 1,2-dichlorobenzene and tetramethyl urea have been detected in recovery well RW-1. Carbon tetrachloride is the only constituent that exceeds both the Part 201 cleanup criteria and Part 22 water quality standards.
6) Organic chemical concentrations in monitoring wells MW-25S and MW-25I were below laboratory method detection limits and have decreased. This decline is likely related to the pump and treat activities conducted over the past two years.
7) N-methylaniline and N,N-Dimethylaniline in monitoring wells MW-14I and MW-14D and RW-4 have been fluctuating with time and are not trending downward, which supports the addition of the operation of RW-4 in the groundwater recovery system.
8) The groundwater plumes have changed little in area, although concentrations overall have decreased. The groundwater recovery and treatment system appear to be effectively preventing expansion of the chloroform and carbon tetrachloride plume. The groundwater recovery and treatment system initially reduced the concentrations of the n-methylanniline and N,N-Dimethylaniline plume. Recent increases in n-methylanniline and N,N-Dimethylaniline indicate that additional pumping from recovery well RW-4 was necessary.
9) The evaluation of data from 1986 to the present indicates that the concentrations of most chemicals have decreased in a manner typical of groundwater systems under the influence of active remedial processes.

Site Inspection

The inspection at the site was conducted on June 23, 2005. In attendance were Pamela Molitor from US EPA, Wally Wagaw and Bill Bolio from MDEQ, Jay Hodges from USACE, and Randy Sherman and Erik Carlson from Shaw Environmental, Inc. The purpose of the inspection was to assess the protectiveness of the remedy and general conditions of the site treatment system.

A complete visual inspection of the remedy was conducted by the entire party. The group performed a tour of the property taking note of the physical condition of the treatment building, infiltration gallery, landfill cover, and security and access. An inspection was also made of the general condition of all of the monitoring wells and recovery wells.

In general the treatment building and equipment was in good physical condition and operating. No damage was noted. The monitoring wells and recovery wells were in good condition and were adequately marked. The landfill cover was in good condition and the vegetation was not in need of mowing. The permanent markers have not yet been installed at the landfill perimeter but this will be finished within the next 12 months.

As part of the institutional controls, access to the site is restricted by a gate at the Bard street entrance. The gate was not secured with a lock at the time of the inspection. A new lock and chain will be installed in order to secure this gate by September 2006.

VI. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions, and the results of the site inspection indicates that the on-site equipment is functioning as intended by the ROD. The recovery and treatment system and groundwater monitoring should continue operating until cleanup standards are achieved. The current maintenance procedures, as implemented, will maintain the effectiveness of the response actions.

A review of the draft Landfill Monitoring Plan indicated that it will be necessary to update and finalize a monitoring plan that will effectively transition this site from the current recovery system to monitored natural attenuation once the cleanup standards as set forth in the ROD are met.

A review of the ROD was conducted to determine whether institutional controls are in place and functioning as intended. The ROD required institutional controls, such as restrictive covenants, to prohibit the installation of water wells in the site area and any future development that might disturb contaminated soils.

US EPA and MDNR have exchanged draft restrictive covenant documents and are discussing appropriate terms. The Restrictive Covenant (see Attachment 6) will prohibit specific uses on the "Parcel A" and the "Parcel B". (See, Table below). In addition to prohibiting groundwater use, and residential or further commercial development, the restrictive covenant prohibits activities that would interfere with, damage, or otherwise impair the effectiveness of any response action. Further, the restrictive covenant states that the restrictions run with the land and shall be binding upon the owner and their respective successors, assigns and transferees, and the restrictions "As to Parcel B" shall continue in perpetuity, or for the other parcels, remain until US EPA issues a determination or a court of competent jurisdiction rules to either modify or terminate the restrictions.

Restricted Areas (areas that do not support UU/UE)	**IC Objective / Mechanism Identified in ROD**	**What IC is in place?**
Solid waste landfill cap	restrictive covenant to prohibit construction in former landfill area	anticipated that restrictive covenant will be executed within 12 months
Groundwater plume area	restrictive covenant prohibiting groundwater use	anticipated that restrictive covenant will be executed within 12 months

It is anticipated that the restrictive covenant will be executed and recorded in the chain of title of the Duell & Gardner Landfill property within 12 months. A full review of the restrictive covenant will be conducted to determine whether the restrictions are sufficient. While no one is currently using the groundwater in the area, full implementation of the controls is necessary to ensure future

landowners do not install groundwater wells. Within 12 months the restrictive covenant will be evaluated to determine if it "runs with the land", has been executed correctly, may be negatively impacted by prior in time encumbrances, provide adequate notice to future owners and will be monitored to ensure its continued existence.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Land use remains consistent with that at the time of the original ROD. Attachment 8 compares the groundwater cleanup standards established in the ROD to current Michigan Part 201 standards and maximum contaminant levels (MCLs). For all of the contaminants the cleanup standards have either remained the same, or have increased. Michigan's 2005 Part 201 residential drinking water cleanup criteria for chloroform (80ppb), tetrachloroethylene (45ppb), and aniline (53ppb) are higher than the residential criteria established in the ROD. Michigan 2005 residential drinking water cleanup criteria for n,n-dimethylaniline (16ppb) and gentian violet (15ppb) remain the same. A review of Attachment 8 indicates that maximum concentrations of the constituents are significantly lower than values presented in the ROD. Carbon tetrachloride at 9.2ppb and N,N-Dimethylaniline at 13 ppb are the only constituents remaining that exceed the ROD criteria. Carbon tetrachloride in recovery well RW-1 is the only constituent at the site exceeding Michigan's 2005 residential drinking water criteria of 5ppb. Therefore the standards for this site are considered protective and significant progress has been made toward reaching the remedial action objectives for the site.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary

There have been no changes in the physical conditions of the site that would effect the protectiveness of the remedy. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there have been no changes to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

The groundwater recovery system has made substantial progress toward meeting the ROD goals. As a result, carbon tetrachloride is the only constituent that exceeds both the Part 201 cleanup criteria and Part 22 water quality standards. US EPA's contractor will update the Landfill Monitoring Plan this year and discussions should begin between US EPA and its contractor, and MDEQ regarding the transition of the site from the current recovery and treatment system to monitored natural attenuation once ROD goals for groundwater are achieved.

VII. Issues

Table 2: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
IC Implementation Plan not in place	N	Y
Unsecure gate entrance to site	N	Y
Update and finalize Landfill Monitoring plan	N	N
Residential well sampling	N	N

VIII. Recommendations and Follow-up Actions

Table 3: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
IC Implementation Plan	Place restrictive covenants on section of property where residential standards are exceeded; ensure they prohibit construction near extraction system.	US EPA	US EPA	9/29/06	N	Y
Secure entrance	Place new chain and lock on gate at entrance to site.	US EPA	US EPA	9/29/06	N	Y
Landfill Monitoring Plan	Update and finalize Landfill Monitoring Plan.	US EPA	US EPA	9/29/06	N	N
Residential well sampling	Contact county health department to determine need for follow up well sampling	MDEQ	US EPA	9/29/06	N	N

IX. Protectiveness Statement

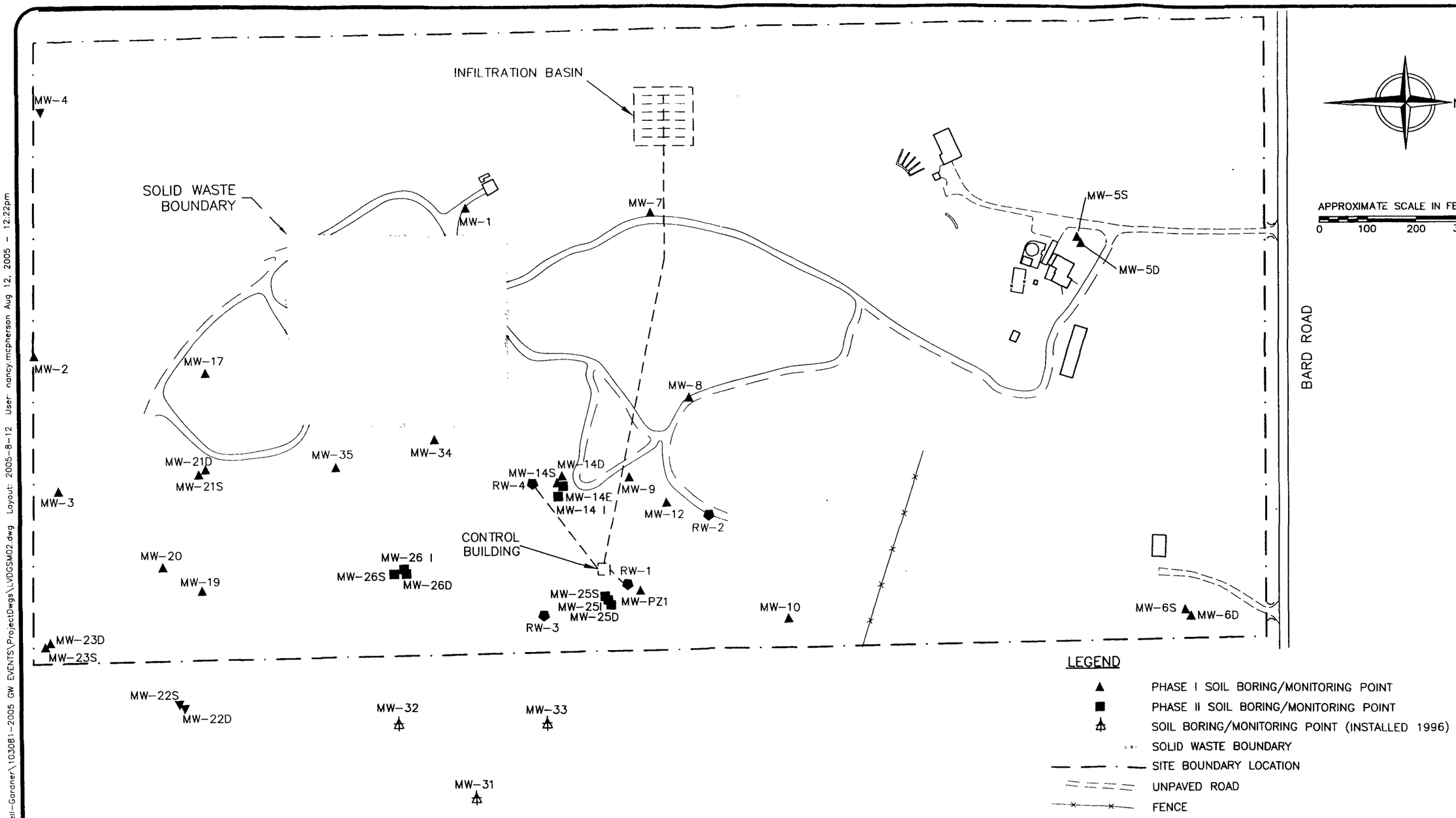
The remedy at the Duell & Gardner Landfill Site currently protects human health and the environment because all immediate health threats and exposures have been eliminated. The groundwater recovery and treatment system and monitoring program indicates that chemicals of concern do not extend beyond the property boundary of the site and are protective of human health and the environment. However, in order for the remedy to be protective in the long-term, institutional controls need to be put in place to prevent exposure to contaminated groundwater and soils.

X. Next Review

The next five-year review for the Duell & Gardner Landfill Site is required by September 29, 2010, five years from the date of this review.

Attachment 1

Site Map



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Shaw® EMCON/OWT, Inc.

MAP MODIFIED FROM EARTH TECH PDI REPORT, NOV 1996 AND ADRIAN BROWN "PROPOSED PUMPING SCHEMATIC", MAY 2001.

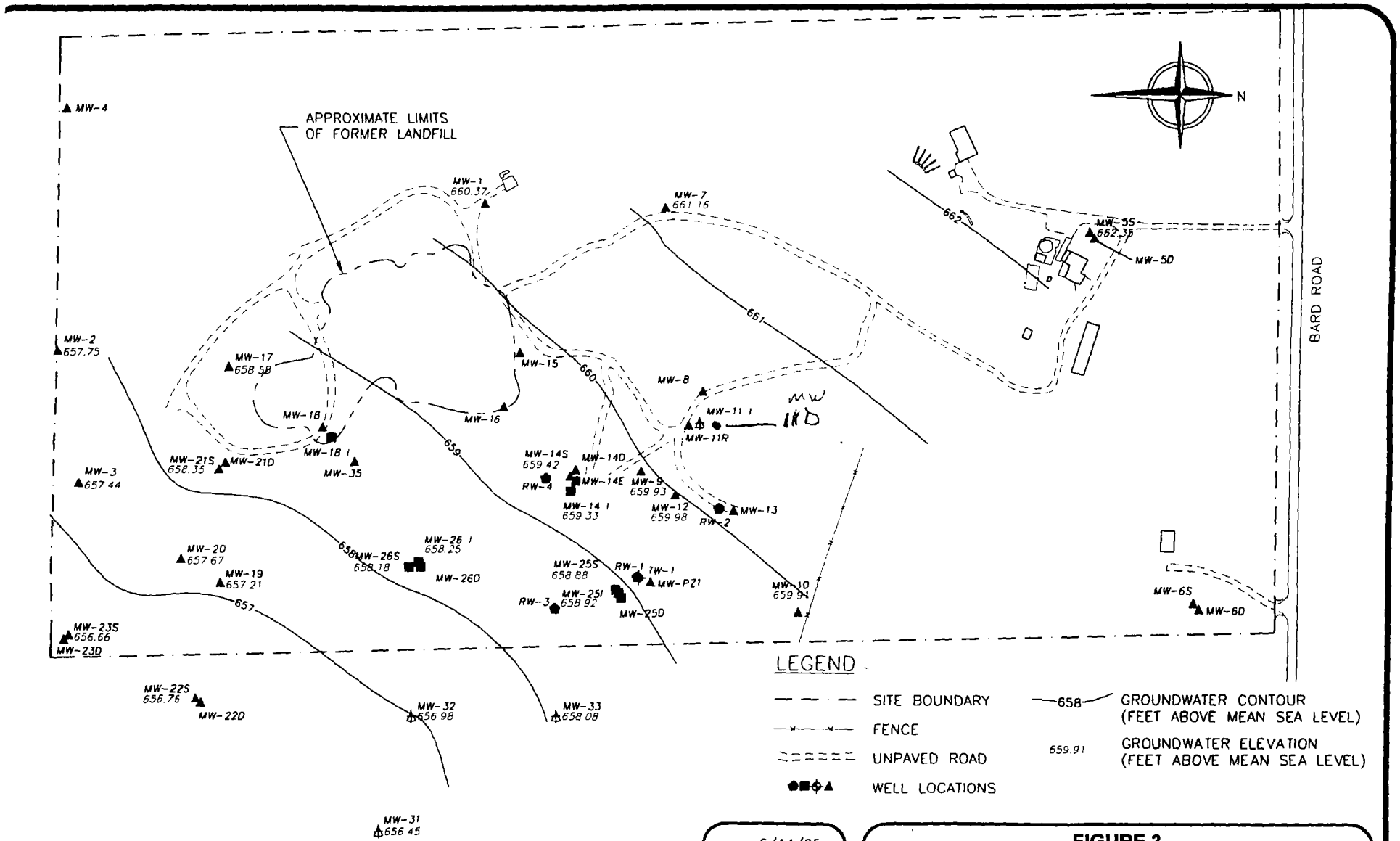
DATE 8/12/05
DWN ACE
APP GRS
REV NAM
PROJECT NO. 103081

FIGURE 2
DUELL AND GARDNER LANDFILL
DALTON TOWNSHIP, MICHIGAN

SITE MAP

Attachment 2

Groundwater Flow Map



Shaw®
Shaw Environmental, Inc.

TAKEN FROM: EARTHTECH PDI REPORT, 11/96

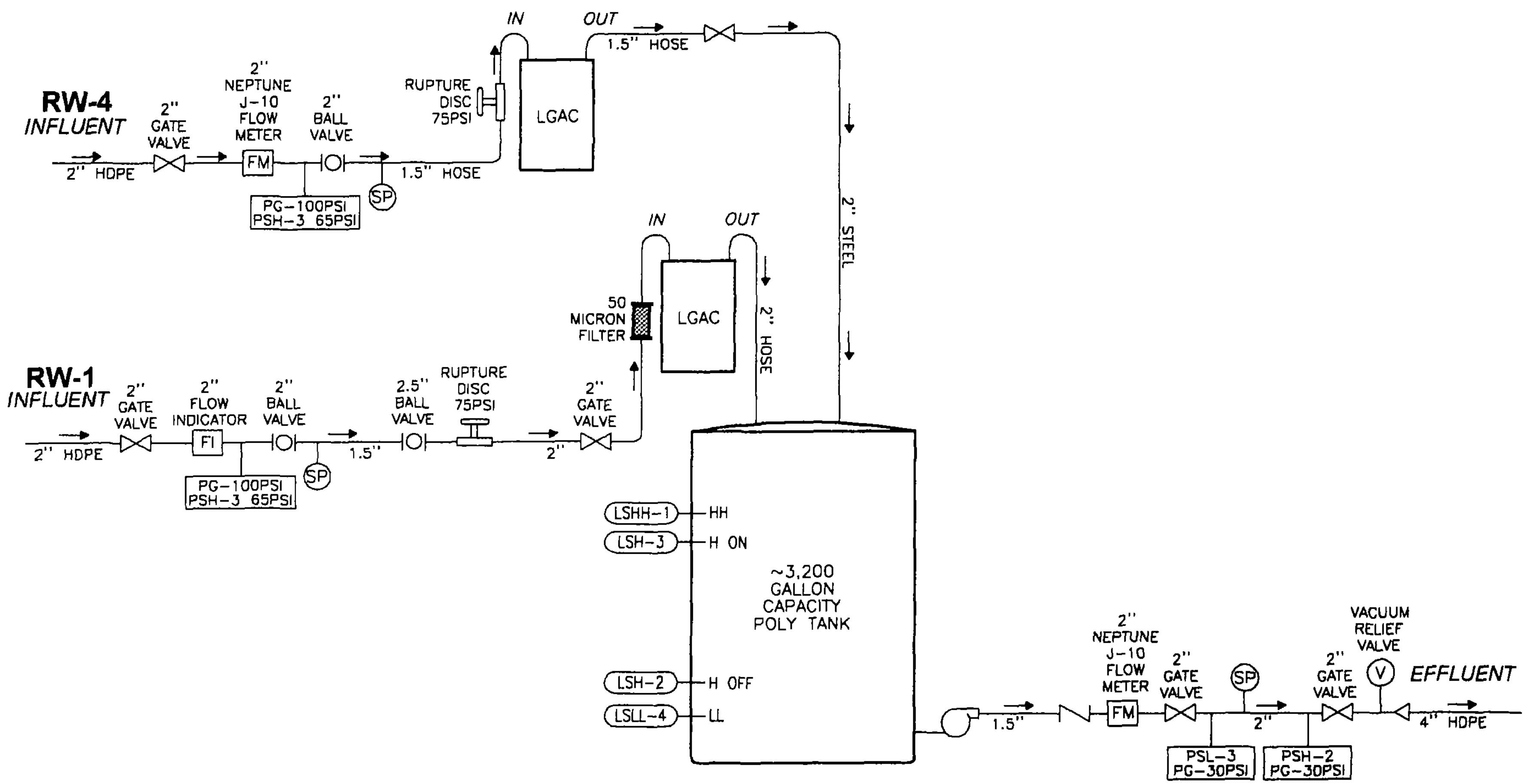
DATE	6/14/05
DWN	NAM
APP	GRS/EJC
REV	
PROJECT NO.	103081

FIGURE 3
DUELL AND GARDNER LANDFILL
DALTON TOWNSHIP, MICHIGAN

APRIL 26, 2005
GROUNDWATER GRADIENT MAP

Attachment 3

Process Flow Chart



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DATE	05/24/04
DWN	DGS
APP	GRS
REV	DGS
PROJECT NO.	103081

FIGURE 3

DUELL & GARDNER LANDFILL
DALTON TOWNSHIP
MUSKEGON, MICHIGAN

PROCESS FLOW DIAGRAM

Attachment 4

Reconfigured Process Flow Chart

XREF Files: IMAGE Files:
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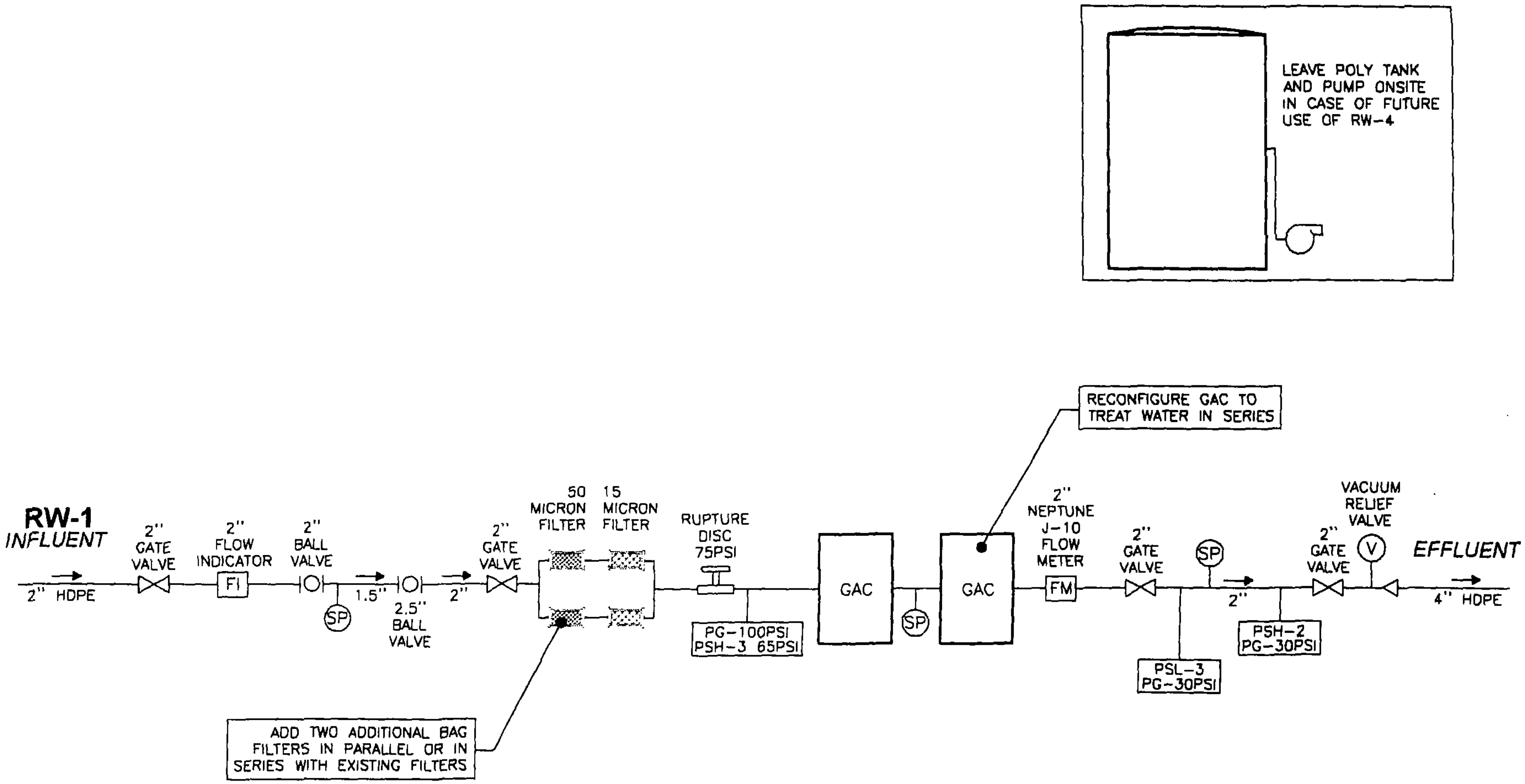

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Shaw Environmental, Inc.

DATE	9/13/04
DWN	DGS
APP	GRS/EC
REV	DGS
PROJECT NO.	806717

FIGURE 4
DUELL & GARDNER LANDFILL
DALTON TOWNSHIP
MUSKEGON, MICHIGAN
RECONFIGURED PROCESS FLOW DIAGRAM

Attachment 5

Groundwater Model Evaluation

APPENDIX G

GROUNDWATER MODEL EVALUATION

GROUNDWATER MODELING EVALUATION

DUELL & GARDNER LANDFILL
DALTON TOWNSHIP, MICHIGAN

Prepared for

U.S. Army Corps of Engineers
P.O. Box 13287
Building 527
Offut AFB
Offut, NE 58113

Prepared by

Shaw Environmental
14155 Farmington Road
Livonia, Michigan 48154
(734) 524-9610

Project No. 103081
September 2004

Executive Summary

This report evaluates whether the groundwater recovery system is effectively controlling the groundwater plumes located at the D&G Landfill. Results of conceptual model for recovery well RW-1 indicate that the two groundwater plumes are not sufficiently captured at a pumping rate of 25 gpm and 40 gpm. Results of the conceptual model for recovery wells RW-1 and RW-4 indicates that operating two recovery wells should sufficiently capture and contain the majority of the groundwater plumes.

Shaw recommends that recovery well RW-4 be returned to operation. Shaw recommends a groundwater extraction system with two (2) pumping wells (RW-1 and RW-4) operating at 40 gpm. The minimum desired effect can be achieved with two (2) pumping wells (RW-1 and RW-4) operating at 25 gpm and 40 gpm, respectively.

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Introduction

On behalf of U.S. Environmental Protection Agency (USEPA) Region V and the U.S. Army Corps of Engineers (USACE), Shaw Environmental Inc. (Shaw) submits this groundwater modeling evaluation for the groundwater recovery and treatment system installed at the Duell & Gardner (D&G) Landfill. **Figure 1** is a map showing the site location. **Figure 2** is a site map that shows the location of groundwater monitoring wells.

The main goal of the groundwater recovery system is to protect human health from exposure to impacted water associated with two contaminant plumes at the D&G Landfill. The purpose of this report is to evaluate whether the groundwater recovery system is effectively controlling the groundwater plumes located at the D&G Landfill. This report provides groundwater modeling results to determine whether the groundwater recovery system should be adjusted to include additional recovery wells RW-2, RW-3, and RW-4.

Background

On April 23, 2001, USEPA directed USACE to design and build an interim groundwater recovery system with a life expectancy of 10 years. In response to this request, USACE designed and constructed a system consisting of four recovery wells, an infiltration gallery, a treatment building containing two granular activated carbon units (GAC), various pumps, a 3,000 gallon retention tank, conveyance piping, appurtenant devices, and automatic shut down capabilities. This work was completed by August 3, 2001. Based on the pre-design work, submersible pumps were installed in recovery wells RW-1 and RW-4.

Adrian Brown Consultants Inc. (ABC, 2000) performed pre-design work, which included plume delineation, aquifer testing, hydraulic containment modeling, and reporting from July 2000 through August 2001.

The groundwater treatment system was installed to treat regulated levels (State of Michigan Part 22 Standards) of organic compounds in groundwater. The dissolved phase contamination was potentially caused by historic landfilling activities located on the property (although the exact source area was not determined). Previous investigative reports by Waryzn (1992) and Earthtech (1996) indicated that disposal activities had a minimal impact on the water quality in the surrounding private wells. These reports indicated that dissolved phase contaminants were located in two groundwater contamination plumes emanating from two areas on the site. One contaminant plume consists of chloroform and carbon tetrachloride. The other contaminant plume consists of aniline and n, n-dimethylaniline. **Figure 3** shows the approximate locations of these plumes.

ABC installed four recovery wells, RW-1 through RW-4. The location of these wells is shown on **Figure 2**. Following completion of the design, Shaw constructed the groundwater recovery and treatment system. This work was substantially completed by August 3, 2001 and the system operated recovery well RW-1 and RW-4 from June 2001 through December 2001. Based on the chemical concentrations of the groundwater and the location of the recovery wells, the system was modified to operate only recovery well RW-1.

Following the initial startup, the recovery system was operated continuously, but the performance of the recovery system was affected by chemical properties of the groundwater. Recovery well RW-1 was creating biologic fouling through the treatment system. In attempts to control the fouling, Shaw added filters to pre-treat the water and implemented a well rehabilitation process involving acid treatment of recovery well RW-1. In 2003, the treatment system was reconfigured to provide higher operating efficiency.

The system was reconfigured as described below:

- The original GAC units for RW-1 and RW-4 were removed.
- Two new GAC units in series were incorporated into the system.
- Because of heavy sedimentation, two additional bag filters were added, for a total of four.
- The wells were chemically treated with acid on two occasions.
- The 3,000 gallon retention tank is now used for GAC backwashing.
- The original repressurization pump broke and was replaced.
- A smaller volume pump was installed to pump the backwash water into the infiltration gallery.

Previous Hydrogeologic Investigations

Waryzn (1992) completed a remedial investigation (RI) of the D&G Landfill to determine the nature and extent of contamination at the site in the soil, subsurface water, sediment, and groundwater. Field activities for the RI were conducted in two phases. Phase I was conducted during December 1986 through December 1987. Phase II was completed from February 1989 through January 1992. A total of 89 soil samples were collected from 54 locations. In addition, 94 groundwater samples were collected from monitoring wells and 46 groundwater samples were collected from private residential wells.

The results of the RI by Waryzn (1992) are provided in the following hydrogeologic information:

- Soil encountered below the surface consisted predominantly of very fine to medium sand. Silt, clay, or silt/clay lenses were encountered at several locations; however, a continuous aquitard was not encountered. (Warzyn, 1992, Section 3.5 and 3.6)

- One aquifer has been identified at the site. Groundwater flow at the site was towards the southeast. Estimated hydraulic conductivity (K) values for the aquifer averaged 178 gal/day/ft^2 and transmissivity (T) values averaged 1,155 gal/day/ft. (Warzyn, 1992, Section 3.6)

- Soil at the site has been impacted by semi-volatile organic carbons (SVOC's) including aniline, N,N-dimethylaniline, and crystal violet. (Warzyn, 1992)

- Results of groundwater sampling indicated that four groundwater contamination plumes appeared to be emanating from three areas on the site. The extents of the chloroform, carbon tetrachloride, and N,N-dimethylaniline plumes were not fully characterized. (Warzyn, 1992)

- Based on the analytical results from the site monitoring wells and the private wells, it appeared that disposal activities had a minimal impact on the water quality in the surrounding private wells. (Warzyn. 1992)

- Migration of organic contaminants through surface and sub-surface soil into the groundwater had not occurred to a great extent, with the exception of chloroform, carbon tetrachloride, aniline and N,N-dimethylaniline. (Warzyn, 1992)

Earthtech (1996) performed a Pre-Design Investigation (PDI) to provide the information necessary to fully implement the Remedial Design/Remedial Action. Earthtech (1996) delineated the groundwater impact into two separate plumes.

- The N,N-dimethylaniline plume was centered around MW-14.The downward vertical gradient observed at MW-11 suggested that a N,N-dimethylaniline source area was located between MW-11 and MW-14.

- The carbon tetrachloride/chloroform plume was centered on MW-13, MW-25S, and TW-29. Monitoring well MW-31, MW-32, MW-33, TW-31, TW-28, TW-27, MW-12, and TW-30 defined the extent of the carbon tetrachloride plume.

- The observed reduction of groundwater contamination concentrations and the presence of breakdown products (chloroform) suggested that attenuation and/or dispersion as well as biodegradation was stabilizing or reducing the groundwater plumes.

ABC (2000) conducted hydrogeologic investigation including well installation, water level measurement, groundwater sampling, plume delineation, aquifer testing, and hydraulic containment analyses. Static water levels were measured in thirty-three (33) wells on July 26, 2000. Groundwater flow direction was from the northwest to southwest at a gradient of 0.003 ft/ft.

Using MODFLOW, ABC (2000) modeled the groundwater flow regime to simulate baseline flow conditions. The groundwater model input parameters were hydraulic conductivity (0.013 cm/s), porosity (0.3), and specific yield (0.16). ABC (2000) determined that one well pumping at a rate of 50 gpm would capture all particles from the assumed source area up-gradient, and approximately 100 feet of the down-gradient portion of the plume.

Model Conceptualization

RESSQ, a USEPA computer model, is a semi-analytical model for two-dimensional solute transport that calculates the streamline pattern in an aquifer, location of contaminant fronts about sources at specified times, and concentration versus time at sinks; it assumes a homogeneous, isotropic confined aquifer of uniform thickness, steady state regional flow field, and advection and adsorption only (no dispersion or decay). RESSQC is a slightly modified version of RESSQ presented by Javandel et al., (1984). The additional "C" stands for the Capture Zone. This Well Head Protection Area (WHPA) model computational module delineates time-related capture zones around pumping wells, or contaminant fronts around injection wells, for multiple pumping and injection wells in homogeneous aquifers of infinite aerial extent with steady and uniform ambient ground-water flow.

RESSQC can be used to delineate time-related capture zones for a system ranging from one well to a maximum of 50 pumping wells and 20 injection wells that fully penetrate a homogeneous aquifer. Another capability is that the number of pathlines reverse-tracked from each pumping well may be defined interactively by the user. The particles can be released at any point within the model and subsequently forward or reverse tracked.

For the modeling to be accurate, certain aspects must be defined. Groundwater flow must be three-dimensional in the x-y plane. The aquifer must be homogeneous and may be confined or unconfined as long as the drawdown-to-initial saturated thickness is less than 0.1. Steady groundwater flow is assumed.

The Duell & Gardner landfill and surrounding areas are appropriate for the conditions that are required by this program. The soil at the site consists of very fine to medium sand and therefore a homogeneous and isotropic medium. Water flow is three-dimensional and flows from the southwest to the northeast. Duell & Gardner was initially designed with two pumping wells, but only one has been in use. Enabling the forward tracked pathlines will be advantageous in remediation of the two remaining plumes, provided that the model is set-up correctly, by visually representing how increasing pumping rates and/or duration of pumping periods will affect the plume.

Numerous monitoring wells are located at Duell & Gardner. The model can be used to determine and evaluate the effect that pumping will have on drawdown and the radius of influence. There are no injection wells on the site; however there is an infiltration basin that serves the same purpose and can be represented as a single or multiple injection wells. Once the water has been treated and remediated, it is discharged (injected) up-gradient into the infiltration basin. Due to the size of the infiltration basin at D&G, four injection wells will be used to represent the infiltration basin.

Input Parameters

Shaw utilized the RESSQ model to evaluate different scenarios associated with the D&G Landfill. The following section outlines the input parameters required by the model. For each *problem*, the following parameters were entered into the program:

- Default units of input parameters (feet and days or meters and days)
- Number of pumping wells within the study area
- Number of recharge (injection) wells within the study area
- Minimum/maximum X and Y coordinates of the study area (ft or m)
- Transmissivity of the aquifer (ft^2/d or m^2/day)
- Regional hydraulic gradient (ft/ft or m/m)
- Angle of ambient groundwater flow (0-360º)
- Aquifer porosity (dimensionless)
- Aquifer saturated thickness (ft or m)
- Largest allowable step length, *dl* (ft or m)
- Maximum amount of time for calculating the trace of a pathline (days)
- Number of time-related capture zones to be calculated for each pumping well (max = 7)

Therefore, uniform values of hydraulic conductivity, porosity, and specific yield were specified to the model. A hydraulic conductivity of 1.3×10^{-2} cm/s, specific yield of 0.16,

and total porosity of 30% were used for the model. The recharge rate was set at 10.5 inches per year, (ABC 2000).

Based on how the problem is set up and what elements apply, additional parameters that must be entered include the following items:

- *Capture zone*: the time value for the capture zone in days must also be entered.
- *Pumping well*: the x and y coordinates of the wells, the well discharge rates, and the well radii are the required parameters. Additionally, the ratio of the number of pathlines to the number plotted and the number of pathlines to be computed to delineate time-related capture zone must also be entered.
- *Injection well*: the x and y coordinates, the well recharge rates and the well radii minus default are the required parameters.
- *Forward tracked pathline*: the x and y starting coordinates are required.

Conceptual Model #1

Conceptual Model #1 is comprised of pumping well RW-1 and the Infiltration Basin. This is the simplest model and is similar in design to the groundwater recovery system that is currently operating at the D&G Landfill. For this model, Shaw used a groundwater recovery well, RW-1, operating at an actual pumping rate of 25 gallons per minute and 40 gallons per minute that discharges to four imaginary injection wells representing the infiltration basin.

Using the information available from previous hydrogeologic investigations, the following input parameters were used for this conceptual model:

- The maximum x and y coordinates were set at 3,500 feet and 5,000 feet respectively with a spatial step length of 50 feet; hydraulic head calculation were also performed. The Uniform Grid information was set at 100 columns and 50 rows with the x and y coordinates being 3,694.11 feet and 2,333.29 feet, respectively along with a reference head of 660.00 feet.

- The transmissivity (T) is 158 ft^2/d; the aquifer thickness is 150 feet; the porosity is 0.30; the hydraulic gradient is 0.003 and the angle of ambient groundwater flow is 300 degrees.

- The pumping well (RW-1) specific parameters at 25 gpm include the x and y coordinates, the recharge rate and the well radius which are 2,505.7 feet, 3,611.7 feet, 7,700 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400,

3,770), and (1,500, 3,770). The recharge rate for each well is 1,203 ft^3/d and the well radii are 0.21 feet.

- The pumping well (RW-1) specific parameters at 40 gpm include the x and y coordinates, the recharge rate and the well radius which are 2,505.7 feet, 3,611.7 feet, 7,700 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400, 3,770), and (1,500, 3,770). The recharge rate for each well is 1,925 ft^3/d and the well radii are 0.21 feet.

- There are 20 pathlines (default) in the plotting interval; reverse pathlines were not incorporated into this model. The time limit was set at 1095 days (3 years) with all capture zones being in the same time limit.

The results of Conceptual Model #1 for a pumping rate of 25 gpm are shown in **Overlay 1** of **Figure 4.** RW-1 does not sufficiently capture and contain the two groundwater plumes at a pumping rate of 25 gpm.

The results of Conceptual Model #1 for a pumping rate of 40 gpm are shown in **Overlay 2** of **Figure 4.** RW-1 does not sufficiently capture and contain the two groundwater plumes at a pumping rate of 40 gpm; however, it does encompass a greater area of the target plume.

Conceptual Model #2

Conceptual Model #2 is comprised of pumping wells RW-1 and RW-4 and the Infiltration Basin. This is a more complex model, and the design that was originally designated for the D&G Landfill. For this model, Shaw used groundwater recovery wells RW-1 and RW-4 operating at pumping rates of 40 and 40 gallons per minute and at rates 25 and 40 gallons per minute, respectively, which discharge to four imaginary injection wells representing the infiltration basin.

Using the information available from previous hydrogeologic investigations, the following input parameters were used for this conceptual model:

- The parameters of recovery well RW-1 remain the same for this model.

- The maximum x and y coordinates were set at 3,500 feet and 5,000 feet respectively with a spatial step length of 50 feet; hydraulic head calculation will also be performed. The Uniform Grid information was set at 100 columns and 50 rows with the x and y coordinates

being 3,694.11 feet and 2,333.29 feet, respectively along with a reference head of 660.00 feet.

- The transmissivity (T) is 158 ft^2/d; aquifer thickness is 150 feet; the porosity is 0.30; the hydraulic gradient is 0.003 and the angle of ambient groundwater flow is 300 degrees.

- The pumping well's (RW-4) specific parameters at 40 gpm with RW-1 at 40 gpm, include the x and y coordinates, the recharge rate and the well radius which are 2292.2 feet, 3413.1 feet, 7,700 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400, 3,770), and (1,500, 3,770). The recharge rate for each well is 3,850 ft^3/d and the well radii are 0.21 feet

- The pumping well's (RW-4) specific parameters at 40 gpm with RW-1 at 25 gpm, include the x and y coordinates, the recharge rate and the well radius which are 2292.2 feet, 3413.1 feet, 4,812.8 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400, 3,770), and (1,500, 3,770). The recharge rate for each well is 3,128 ft^3/d and the well radii are 0.21 feet.

- There are 20 pathlines (default) in the plotting interval; reverse pathlines were not incorporated into this model.

- The time limit was set at 1095 days with all capture zones being in the same time limit.

The results of Conceptual Model #2 for both pumping wells at 40 gpm are shown in **Overlay 3** of **Figure 4**. A review of this model indicates that these wells sufficiently capture and contain the two groundwater plumes at pumping rates of 40 gpm.

The results of Conceptual Model #2 for RW-4 at 40 gpm and RW-1 at 25 gpm are shown in **Overlay 4** of **Figure 4**. The wells capture and contain the majority of the groundwater plumes at these pumping rates, although not as completely as when both pumps are at 40 gpm.

Conceptual Model #3

Conceptual Model #3 adds one additional pumping well for a total of three (3) pumping wells and the Infiltration Basin. For this model, Shaw used groundwater recovery wells RW-1, RW-4, and RW-3 operating at maximum pumping rates of 40 gallons per minute and discharging to four imaginary injection wells representing the infiltration basin.

Using the information available from previous hydrogeologic investigations, the following input parameters were used for this conceptual model:

- The parameters of recovery wells RW-1 and RW-4 (both @ 40 gpm) remain the same for this model.

- The transmissivity (T) is 158 ft^2/d; the aquifer thickness is 150 feet; the porosity is 0.30; the hydraulic gradient is 0.003 and the angle of ambient groundwater flow is 300 degrees.

- The pumping well's (RW-3) specific parameters include the x and y coordinates, the recharge rate and the well radius which are 2571.9 feet, 3435.2 feet, 7,700 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400, 3,770), and (1,500, 3,770). The recharge rate for each well is 5,575 ft^3/d and the well radii are 0.21 feet.

- There are 20 pathlines (default) in the plotting interval; reverse pathlines were not incorporated into this model. The time limit was set at 1095 days with all capture zones being in the same time limit.

The results of Conceptual Model #3 with three wells pumping at 40 gpm are shown in **Overlay 5** of **Figure 4**. A review of this model indicates that the combination of recovery wells RW-1, RW-3 and RW-4 completely captures and contains the two groundwater plumes.

Conceptual Model #4

Conceptual Model #4 adds one additional pumping well to the model for a total of four (4) pumping wells and the Infiltration Basin. For this model, Shaw used groundwater recovery wells RW-1, RW-4, RW-3, and RW-2 operating at maximum pumping rates of 40 gallons per minute. All pumping wells discharge to four imaginary injection wells representing the infiltration basin.

Using the information available from previous hydrogeologic investigations, the following input parameters were used for this conceptual model:

- The parameters of recovery well RW-1, RW-3, and RW-4 (all at 40 gpm) remain the same for this model.

- The transmissivity (T) is 158 ft^2/d; the aquifer thickness is 150 feet; the porosity is 0.30; the hydraulic gradient is 0.003 and the angle of ambient groundwater flow is 300 degrees.

- The pumping well's (RW-2) specific parameters include the x and y coordinates, the recharge rate and the well radius which are 2358.6 feet, 3783.4 feet, 7,700 ft^3/d and 0.21 feet, respectively. The infiltration basin's specific parameters are comprised of the four injection wells whose coordinates (in feet) are (1,500, 3,670), (1,400, 3,670), (1,400, 3,770), and (1,500, 3,770). The recharge rate for each well is 7,700 ft^3/d and the well radii are 0.21 feet.

- There are 20 pathlines (default) in the plotting interval; reverse pathlines were not incorporated into this model. The time limit was set at 1095 days with all capture zones being in the same time limit.

The results of Conceptual Model #4 with all four wells pumping at 40 gpm are shown in **Overlay 6** of **Figure 4**. It is clear to see that the combination of RW-1, RW-2, RW-3, and RW-4 also sufficiently captures and contains the two groundwater plumes.

Model Verification

Based on the results from the RESSQC program, Shaw feels that the program accurately represents the current groundwater conditions at the Duell & Gardner Landfill based on the information available. The projected modeling of the pumping wells agrees with the historical data that Shaw has compiled, as well as trends in groundwater transport. This model was established using the same input parameters that ABC (2000) used in determining that their model sufficiently represented the actual site conditions.

Hydraulic head was fixed at 660.00 feet for all models. Static water levels were used to verify that the model was representative of actual site conditions and while determining the reference hydraulic head. Pumping and injection rates ranged from 4,812.8 to 7,700.0 ft^3/day and 1,203.2 to 7,700.0 ft^3/day, respectively.

Conclusions and Recommendations

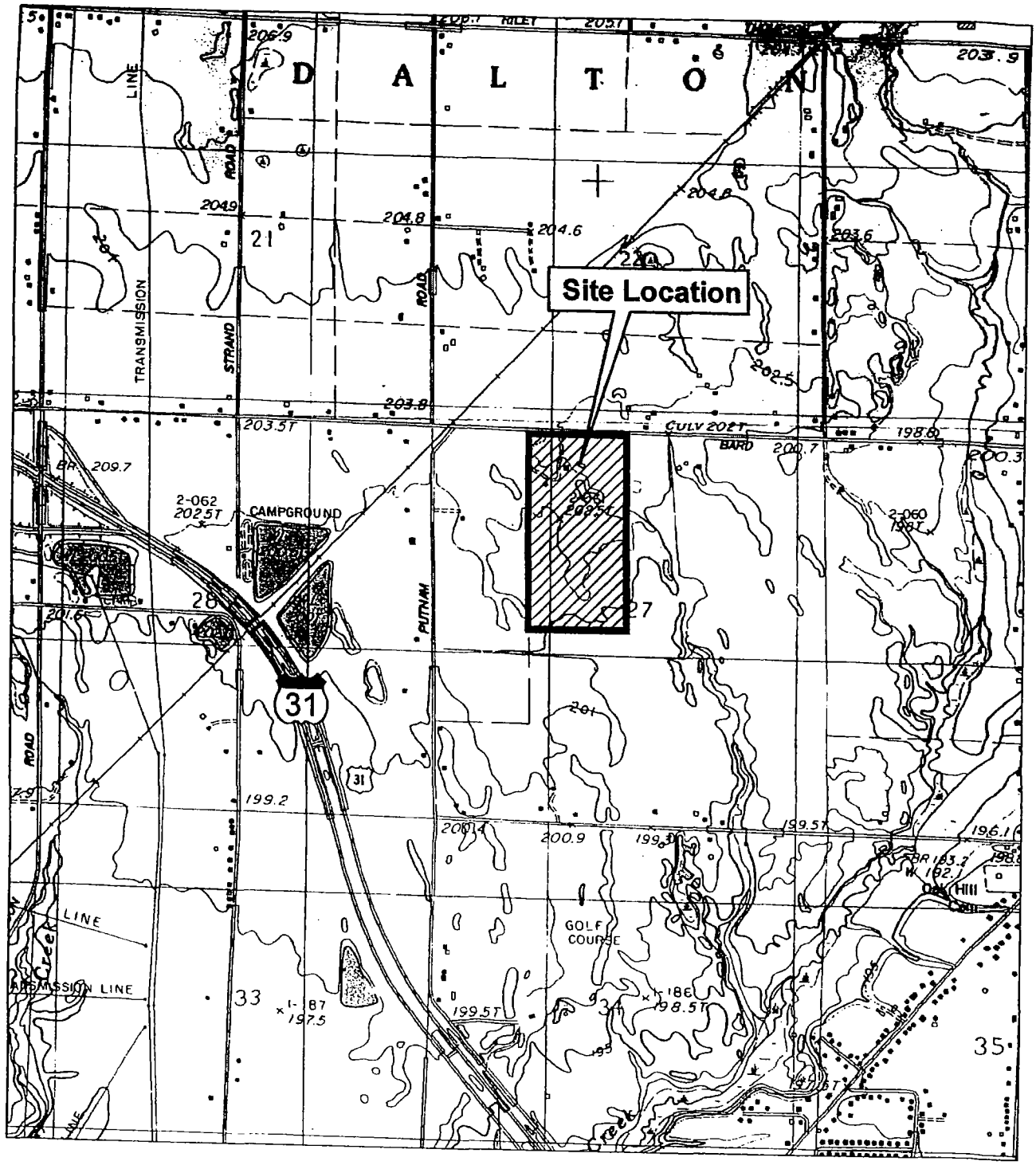
On behalf of USEPA Region V and the USACE, Shaw performed this groundwater modeling evaluation for the groundwater recovery and treatment system installed at the Duell & Gardner (D&G) Landfill.

The main goal of the groundwater recovery system is to protect human health from exposure to impacted water associated with two contaminant plumes at the D&G Landfill. The purpose of this report is to evaluate whether the groundwater recovery system is effectively controlling the groundwater plumes located at the D&G Landfill. This report provides groundwater modeling results to determine whether the groundwater recovery system should be adjusted to include additional recovery wells RW-2, RW-3, and RW-4.

Results of conceptual model for recovery well RW-1 indicate that the two groundwater plumes are not sufficiently captured at pumping rates of 25 gpm and 40 gpm. Results of the conceptual model for recovery wells RW-1 and RW-4 indicate that operating two recovery wells should sufficiently capture and contain the majority of the groundwater plumes.

Shaw recommends that recovery well RW-4 be returned to operation. Shaw recommends a groundwater extraction system with two (2) pumping wells (RW-1 and RW-4) operating at 40 gpm. The minimum desired effect can be achieved with two (2) pumping wells (RW-1 and RW-4) operating at 25 gpm and 40 gpm, respectively.

Figures & Overlays



APPROXIMATE SCALE IN FEET

0 1000 2000 3000

Taken from the

TWIN LAKE, MICH.

7.5 Series U.S.G.S. Topographic Quadrangle

PROVISIONAL EDITION

1985

43086-C2-TM-024

N

QUADRANGLE LOCATION

Shaw

Shaw Environmental, Inc.

DATE	7/27/04
DWN	DGS
APP	JMA
REV	EJC
PROJECT NO.	103081

FIGURE 1

DUELL & GARDNER LANDFILL

DALTON TOWNSHIP, MUSKEGON, MICHIGAN

SITE LOCATION MAP

XREF Files: MACE Files DG-USGS.jpg

File: N:\CADDATA\DWG\Duell-Gardner\103081-2004 GW EVENTS\ProjectDwgs\LVDG_USGS1.dwg Layout: 2002-04-01 User: dianah.stehle Sep 10, 2004 - 2:18pm

Attachment 6

Draft Restrictive Covenant

DRAFT

Revised 07/12/05

RESTRICTIVE COVENANT

MDEQ Reference No.: RC-RRD-03-049

This Declaration of Restrictive Covenants and Environmental Protection Easement is made by and between Eugene Gardner and Carol Gardner and Paul Duell and Mary Duell having an address of 1285 E Bard Road, Muskegon, Michigan ("Grantors") and the Michigan Department of Environmental Quality ("MDEQ"), having an address c/o Director, Michigan Department of Environmental Quality, P.O. Box 30473, Lansing, Michigan 48909-7973, ("Grantee"). The Grantors and Grantee intend that the provisions of this Restrictive Covenant also be for the benefit of the U.S. Environmental Protection Agency ("U.S. EPA") as a third party beneficiary.

Third Party Beneficiary: Grantors on behalf of themselves and their successors, transferees and assigns and the Grantee on behalf of itself and its successors, transferees, and assigns hereby agree that the U.S. EPA and its successors and assigns shall be the Third Party Beneficiary of all the benefits and rights conveyed to the Grantee under this instrument.

The property identified in Attachment A (the "Property") was formerly used as or associated with a former landfill commonly known as the Duell & Gardner Landfill (the "Site"). The Site was placed on the National Priorities List on September 8, 1993 and is a facility, as that term is defined in Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, MCL 324. 20102 *et seq.* ("NREPA"). The Property is subject to on-going remedial actions, pursuant to the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C., as amended, Section 9601 *et seq.* ("CERCLA") and Part 201 of the NREPA in accordance with the Record of Decision issued by the United States Environmental Protection Agency ("USEPA") on September 7, 1993 and amended on September 30, 2001 (collectively, the "Record of Decision"). Information pertaining to environmental conditions at the Site and the response activities being undertaken or to be undertaken at the Property by the USEPA and/or the Michigan Department of Environmental Quality ("MDEQ") is on file with the USEPA and MDEQ.

The restrictions contained in this Restrictive Covenant are based upon information available to the MDEQ at the time this Restrictive Covenant was approved by the MDEQ. Failure of the response activities to achieve and maintain the criteria, exposure controls, and requirements specified in the Record of Decision; future changes in the environmental condition of the Property; the discovery of environmental conditions at the Property that were not accounted for in the Record of Decision; or use of the Property in a manner inconsistent with the restrictions described herein, may result in this Restrictive Covenant not being protective of public health, safety, and welfare, and the environment.

Attachment A to this Restrictive Covenant provides the legal description(s) and a survey that distinguishes those portions of the Property that are subject to land use or resource use restrictions as specified herein.

Property Tax ID Number of Property: _61-07-027-100-0006-00_Parcel A_

DRAFT

Definitions

"Owner" means at any given time the then current title holder of the Property or any portion thereof.

All other terms used in this document which are defined in CERCLA, 42 U.S.C., as amended, Section 9601 *et seq.*; Part 3, Definitions, of the NREPA; Part 201 of the NREPA; or the Part 201 Administrative Rules ("Part 201 Rules"), 1990 AACS R 299.5101 et seq., shall have the same meaning in this document as in Parts 3 and 201 of the NREPA and the Part 201 Rules, as of the date of filing of this Restrictive Covenant.

NOW THEREFORE, Grantors, on behalf of themselves, their successors and assigns, do hereby covenant and declare that the Property shall be subject to the restrictions on use set forth below, and conveys and warrants to the Grantee, and its assigns and to the United States of America, and its assigns, as Third Party Beneficiary, 1) the right to enforce such use restrictions, and 2) an environmental protection easement of the nature and character, and for the purposes hereinafter set forth, with respect to the Property.

Declaration of Land Use or Resource Use Restrictions

1. The Owner shall restrict the use of the Property to those uses compatible with the response activities and remedial actions necessary to protect public health, safety or welfare or the environment pursuant to CERCLA and Part 201 of the NREPA and as necessary to avoid exacerbation, as defined in Section 20101(1)(n) of the NREPA, of existing contamination on the Property.

2. The Owner shall prohibit activities at the Property that may interfere with a remedial action, operation and maintenance, monitoring, or other measures necessary to assure the effectiveness and integrity of the remedial actions.

3. The Owner shall prohibit the use of groundwater underlying the Property for any purpose. Wells shall not be installed on the Property except as provided under response activity work plans approved by the US EPA or the MDEQ.

4. The Owner shall prohibit any activity that interferes or alters any leachate/groundwater collection system, leachate/groundwater treatment system, or monitor well network and their associated components located on the Property.

5. The Owner shall prohibit any activity that disrupts, disturbs, or in any way compromises the landfill cap present on the portion of the Property more specifically described in Attachment B.

6. The Owner also acknowledges that the Property is subject to on-going remedial actions pursuant to the CERCLA and Part 201 of the NREPA and that the implementation of additional response activities on the Property may be required to protect public health, safety or welfare or the environment.

Notice. The Owner shall provide notice to the USEPA and MDEQ of the Owner's intent to convey any interest in the Property 14 days prior to consummating the conveyance. A conveyance of title, an easement, or other interest in the Property shall not be consummated by the Owner without adequate and complete provision for compliance with the terms and conditions of this Restrictive Covenant.

Access. Grantor hereby grants to Grantee, and its assigns, and to the United States of America, and its assigns, as Third Party Beneficiary, an irrevocable and continuing right of access at all reasonable times to the Property for the purposes of:

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(a) Overseeing and /or implementing the response activities required in the ROD, or other formal CERCLA decision documents affecting the Property or any associated workplans;

(b) Verifying any data or information submitted to U.S. EPA and /or MDEQ and determining and monitoring compliance with the ROD and any implementing Statement of Work;

(c) Verifying that no action is being taken on the Property in violation of the terms of this instrument or of any federal or state environmental laws or regulations;

(d) Monitoring Response Activities on the Property and conducting investigations relating to contamination on or near the Property, including, without limitation, sampling of air, water, sediments, soils, and specifically, without limitation, obtaining split or duplicate samples;

(e) Conducting periodic reviews of the Response Activities at the Property and at the Site, including but not limited to, reviews required by applicable statutes and/or regulations;

(f) Implementing additional or new Response Activities if U.S. EPA and the MDEQ determine that such actions are necessary.

Nothing in this instrument shall limit or otherwise affect U.S. EPA's or MDEQ's right of entry and access or authorities to take Response Activities as defined in this instrument, as well as in Section 20101(1)(ee) of Part 201 of the NREPA, under CERCLA, the National Contingency Plan, the NREPA, and any successor statutory provisions, or other state or federal law.

Term and Enforcement of Restrictive Covenant. This Restrictive Covenant shall run with the Property and shall be binding upon all future owners, successors, lessees or assigns and their authorized agents, employees, or persons acting under their direction and control. The MDEQ or U.S. EPA may require modifications to the restrictions contained in this Declaration of Restrictive Covenants and Environmental Protection Easement as necessary to assure the integrity and effectiveness of the remedial action required under the ROD or to assure the protection of public health, safety, welfare and the environment. A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, assigns and transferees by the person transferring the interest. The U.S. EPA; the State of Michigan, through the MDEQ; and the Owner may enforce the restrictions set forth in this Restrictive Covenant by legal action in a court of appropriate jurisdiction.

Severability. If any provision of this Restrictive Covenant is held to be invalid by any court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions hereof. All such other provisions shall continue unimpaired in full force and effect.

Authority to Execute Restrictive Covenant. The undersigned person executing this Restrictive Covenant is the Owner, or has the express written permission of the Owner, and represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

IN WITNESS WHEREOF, the said Owner of the above-described Property has caused this Restrictive Covenant to be executed on this ___ day of _____, 20__.

Eugene Gardner and wife Carol Gardner
1285 E Bard Road, Muskegon, MI
Paul Duell and wife Mary Duell

DRAFT

Signed in the presence of:

_____ _____

_____ _____

Witness *[Print or type name]* Witness *[Print or type name]*

STATE OF MICHIGAN
COUNTY OF Muskegon

The foregoing instrument was acknowledged before me this _____ day of _____, 20__ by Eugene Gardner and wife Carol Gardner and Paul Duell and wife Mary Duell.

_____
Notary Public
[Print or type name]
[Commissioned in] County, [State]

My Commission Expires: _____

Prepared by: ***[Type name of preparer]***
[Title and address]

AGREED AND CONSENTED TO BY OWNER: DRAFT

RC-RRD-03-049

_____

Eugene Gardner

_____

Carol Gardner

_____

Paul Duell

_____

Mary Duell

STATE OF MICHIGAN
COUNTY OF Muskegon

The foregoing instrument was acknowledged before me this _____ day of _____, 20__ by Eugene Gardner and wife Carol Gardner and Paul Duell and wife Mary Duell.

_____

Notary Public

[Print or type name]
[*Commissioned in*] County, [State]

My Commission Expires: _____

DRAFT

ATTACHMENT A

Legal Description of the Property

Township of Dalton, County of Muskegon, State of Michigan to wit:

That part of the East 1/2 of the Northwest 1/4 of Section 27, Township 11 North, Range 16 West described as follows:

Beginning on the North and South 1/4 line South 00 degrees 30 minutes 17 seconds West 1060.26 feet from the North 1/4 corner of said Section 27; thence continuing along said 1/4 line South 00 degrees 30 minutes 17 seconds 813.44 feet; thence North 89 degrees 29 minutes 43 seconds West 435.00 feet; thence North 00 degrees 30 minutes 17 seconds East 230.00 feet; thence North 89 degrees 29 minutes 43 seconds West 405.00 feet; thence South 00 degrees 30 minutes 17 seconds West 38.47 feet; thence North 89 degrees 29 minutes 43 seconds West 471.87 feet to the West line of the East 1/4 of the Northwest 1/4; thence along said West line North 00 degrees 37 minutes 17 seconds East 667.14 feet; thence South 87 degrees 31 minutes 08 seconds East 1311.29 feet to the point of beginning. Continuing 20.96 acres.

and

Commencing at the North 1/4 corner of said Section 27; thence along the North and South 1/4 line South 00 degrees 30 minutes 17 seconds West 2103.70 feet; thence North 89 degrees 29 minutes 43 seconds West 435.00 feet for the point of beginning; thence continuing North 89 degrees 29 minutes 43 seconds West 405.00 feet; thence North 00 degrees 30 minutes 17 seconds East 460.00 feet; thence South 89 degrees 29 minutes 43 seconds East 405.00 feet; thence South 00 degrees 30 minutes 17 seconds West 460.00 feet to the point of beginning. Continuing 4.28 acres.

Bearings based on state plan coordinate system.

DRAFT

ATTACHMENT B

Legal Description of the Capped Portions of the Property

Township of Dalton, County of Muskegon, State of Michigan to wit:

That part of the East 1/2 of the Northwest ¼ of Section 27, Township 11 North, Range 16 West, described as follow:

Commencing at the North 1/4 corner of said Section 27; thence along the North and South 1/4 line South 00 degrees 30 minutes 17 seconds West 2103.70 feet; thence North 89 degrees 29 minutes 43 seconds West 435.00 feet for the point of beginning; thence continuing North 89 degrees 29 minutes 43 seconds West 405.00 feet; thence North 00 degrees 30 minutes 17 seconds East 460.00 feet; thence South 89 degrees 29 minutes 43 seconds East 405.00 feet; thence South 00 degrees 30 minutes 17 seconds West 460.00 feet to the point of beginning. Continuing 4.28 acres. Bearings bases on state plan coordinate system.

Act No. 459
Public Acts of 1996
Approved by the Governor
December 21, 1996
Filed with the Secretary of State
December 26, 1996

STATE OF MICHIGAN
88TH LEGISLATURE
REGULAR SESSION OF 1996

Introduced by Reps. Hammerstrom, McBryde, Hill, Hanley, Goschka, Jellema, Green, Brackenridge, Crissman and Galloway

ENROLLED HOUSE BILL NO. 5858

AN ACT to amend section 1 of Act No. 103 of the Public Acts of 1937, entitled "An act to prescribe certain conditions relative to the execution of instruments entitled to be recorded in the office of the register of deeds," being section 565.201 of the Michigan Compiled Laws.

The People of the State of Michigan enact:

Section 1. Section 1 of Act. No. 103 of the Public Acts of 1937, being section 565.201 of the Michigan Compiled Laws, is amended to read as follows:

Section 1. (1) An instrument executed after October 29, 1937 by which the title to or any interest in real estate is conveyed, assigned, encumbered, or otherwise disposed of shall not be received for record by the register of deeds of any county of the state unless that instrument complies with each of the following requirements:

(a) The name of each person who executed the instrument is legibly printed, typewritten or stamped upon the instrument immediately beneath the signature of each person and the address of each person is printed, typewritten, or stamped upon the face of the instrument.

(b) A discrepancy does not exist between the name of a person as it appears either in the body of the instrument or in the acknowledgment or jurat, as printed, typewritten or stamped upon the instrument beneath the signature, and in the signature of that person.

(c) The name of each witness to the instrument is legibly printed, typewritten or stamped upon the instrument immediately beneath the signature of the witness.

(d) The name of any notary public whose signature appears upon the instrument is legibly printed, typewritten or stamped upon the instrument immediately beneath the signature of that notary public.

(e) Wherever in this act the name of a person is required to be "printed, typewritten or stamped upon such instrument immediately beneath the signature" of the person, it is the intent of the legislature to require that the signature be written upon the instrument directly preceding the name "printed, typewritten or stamped". That signature shall not, however, be superimposed upon the name so as to render either illegible. However, the instrument is entitled to be received for record if the name and signature are, in the discretion of the register

of deeds, so placed upon the instrument as to render the connection between the two apparent. Any instrument received and recorded by a register of deeds shall be conclusively presumed to comply with this act. The requirements contained in this act are cumulative to the requirements imposed by any other act relating to the recording of instruments.

(f) The address of each of the grantees in each deed of conveyance or assignment of real estate, including the street number address if located within territory where street number addresses are in common use, or, if not, the post office address, is legibly printed, typewritten, or stamped on the instrument.

(g) If the instrument is executed before April 1, 1997, each sheet of the instrument is all of the following:

(i) Typewritten or printed in type not smaller than 8-point size.

(ii) Not more than 8-1/2 by 14 inches.

(iii) Legible.

(iv) On paper of not less than 13 (17x22—500) pound weight.

(h) If the instrument is executed after April 1, 1997, each sheet of the instrument complies with all of the following requirements:

(i) Has a margin of unprinted space that is at least 2-1/2 inches at the top of the first page and at least 1/2 inch on all remaining sides of each page.

(ii) Subject to subsection (3), displays on the first line of print on the first page of the instrument a single statement identifying the recordable event that the instrument evidences.

(iii) Is electronically, mechanically, or hand printed in 10-point type or the equivalent of 10-point type.

(iv) Is legibly printed in black ink on white paper that is not less than 20-pound weight.

(v) Is not less than 8-1/2 inches wide and 11 inches long or more than 8-1/2 inches wide and 14 inches long.

(vi) Contains no attachment that is less than 8-1/2 inches wide and 11 inches long or more than 8-1/2 inches wide and 14 inches long.

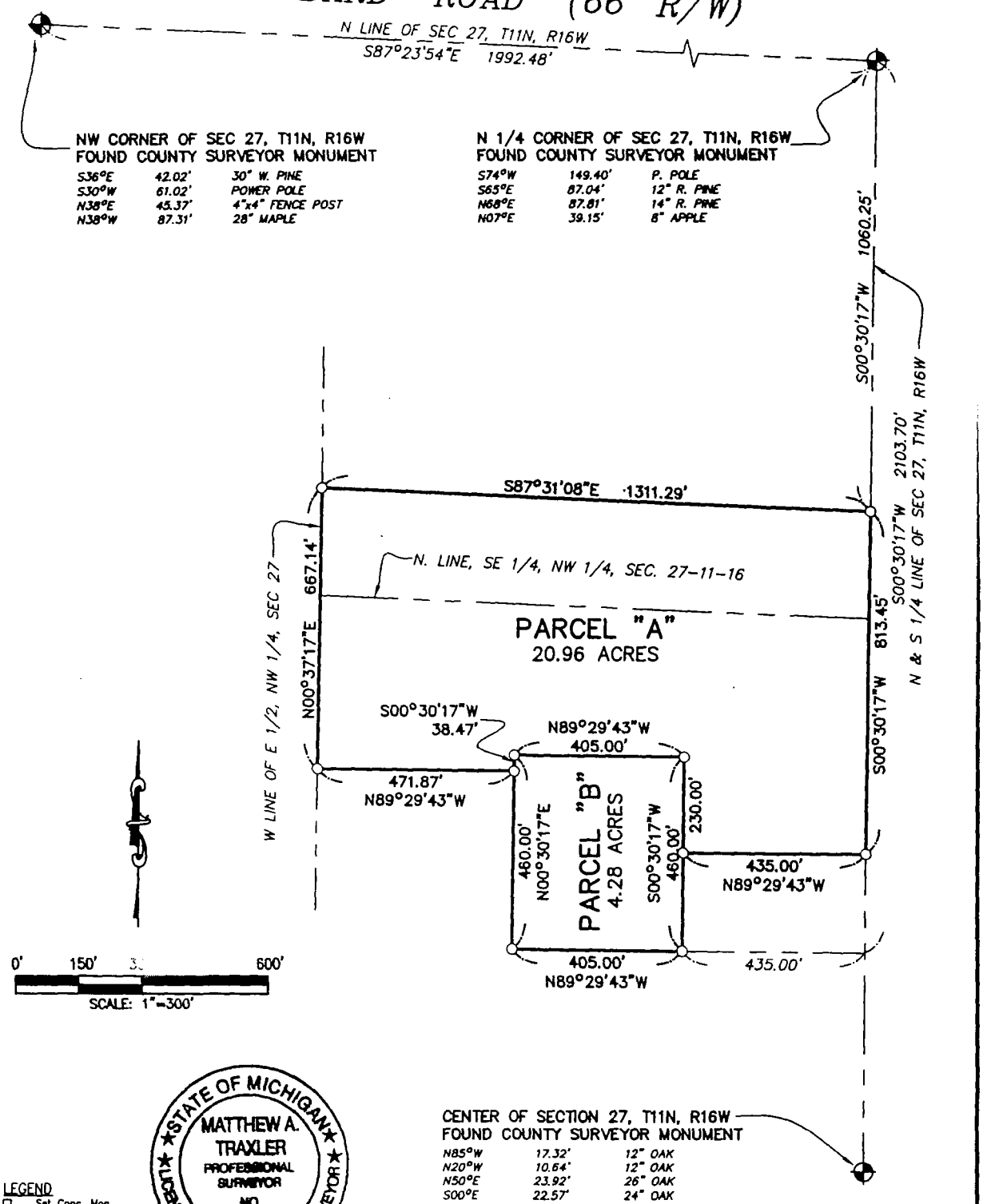
(2) Subsection (1)(g) and (h) do not apply to instruments executed outside this state or to the filing or recording of a plat or other instrument, the size of which is regulated by law.

(3) A register of deeds shall not record an instrument executed after April 1, 1997 if the instrument purports to evidence more than 1 recordable event.

Section 2. This amendatory act shall take effect April 1, 1997.

This act is ordered to take immediate effect.

CERTIFICATE OF SURVEY



STATE OF MICHIGAN
MATTHEW A. TRAXLER
PROFESSIONAL SURVEYOR
NO. 46694
LICENSED PROFESSIONAL SURVEYOR

LEGEND
- □ Set Conc. Mon.
- ■ Found Conc. Mon.
- ○ Set Capped Iron
- ● Found Iron
- P. Platted
- M. Measured
- D. Described

Matthew A. Traxler P.S. No. 46694

I HEREBY CERTIFY THAT I HAVE SURVEYED THE PARCEL(S) OF LAND DESCRIBED AND DELINEATED HEREON, THAT SAID PLAT IS A TRUE REPRESENTATION OF THE SURVEY AS PERFORMED BY ME, AND THAT I HAVE FULLY COMPLIED WITH THE REQUIREMENTS OF SECTION 3, ACT 132, P.A. 1970 AS AMENDED. THIS SURVEY WAS MADE FROM THE ATTACHED LEGAL DESCRIPTION. THE DESCRIPTION WAS GIVEN TO US BY THE PERSON CERTIFIED TO, OR WAS PREPARED BY US FROM INFORMATION OR DOCUMENTS GIVEN TO US BY THE PERSON CERTIFIED TO, AND SHOULD BE COMPARED TO WITH THE ABSTRACT OF TITLE OR TITLE INSURANCE POLICY FOR ACCURACY, EASEMENTS OR EXCEPTIONS.

DRIESENGA & ASSOCIATES, INC.
Engineering | Surveying | Testing
Conceive It. Believe It. Achieve It.
Holland, MI Ph. 616-396-0255 | Grand Rapids, MI Ph. 616-248-3800 | Spring Lake, MI Ph. 616-846-1960 | Kalamazoo, MI Ph. 269-544-1455 | Cadillac, MI Ph. 231-775-7769
www.driesenga.com

FOR *SHAW ENVIRONMENTAL*

IN NW 1/4 OF SECTION 27 T. 11 N., R. 16 W.

DATE 10-14-04 | DRAWN BY MAD / GLK

SHEET 1 OF 2

CERTIFICATE OF SURVEY

This parcel is located in Dalton Township, Muskegon County, Michigan, and is described as follows:

PARCEL A: That part of the East 1/2 of the Northwest 1/4 of Section 27, Town 11 North, Range 16 West described as follows: Beginning on the North and South 1/4 line South 00 degrees 30 minutes 17 seconds West 1060.26 feet from the North 1/4 corner of said Section 27; thence continuing along said 1/4 line South 00 degrees 30 minutes 17 seconds West 813.45 feet; thence North 89 degrees 29 minutes 43 seconds West 435.00 feet; thence North 00 degrees 30 minutes 17 seconds East 230.00 feet; thence North 89 degrees 29 minutes 43 seconds West 405.00 feet; thence South 00 degrees 30 minutes 17 seconds West 38.47 feet; thence North 89 degrees 29 minutes 43 seconds West 471.87 feet to the West line of the East 1/2 of the Northwest 1/4; thence along said West line North 00 degrees 37 minutes 17 seconds East 667.14 feet; thence South 87 degrees 31 minutes 08 seconds East 1311.29 feet to the point of beginning. Containing 20.96 acres.

PARCEL B: That part of the East 1/2 of the Northwest 1/4 of Section 27, Town 11 North, Range 16 West described as follows: Commencing at the North 1/4 corner of said Section 27; thence along the North and South 1/4 line South 00 degrees 30 minutes 17 seconds West 2103.70 feet; thence North 89 degrees 29 minutes 43 seconds West 435.00 feet for the point of beginning; thence continuing North 89 degrees 29 minutes 43 seconds West 405.00 feet; thence North 00 degrees 30 minutes 17 seconds East 460.00 feet; thence South 89 degrees 29 minutes 43 seconds East 405.00 feet; thence South 00 degrees 30 minutes 17 seconds West 460.00 feet to the point of beginning. Containing 4.28 acres.

Matthew A. Traxler P.S. No. 46694

I HEREBY CERTIFY THAT I HAVE SURVEYED THE PARCEL(S) OF LAND DESCRIBED AND DELINEATED HEREON, THAT SAID PLAT IS A TRUE REPRESENTATION OF THE SURVEY AS PERFORMED BY ME, AND THAT I HAVE FULLY COMPLIED WITH THE REQUIREMENTS OF SECTION 3, ACT 132, P.A. 1970 AS AMENDED. THIS SURVEY WAS MADE FROM THE ATTACHED LEGAL DESCRIPTION. THE DESCRIPTION WAS GIVEN TO US BY THE PERSON CERTIFIED TO, OR WAS PREPARED BY US FROM INFORMATION OR DOCUMENTS GIVEN TO US BY THE PERSON CERTIFIED TO, AND SHOULD BE COMPARED TO WITH THE ABSTRACT OF TITLE OR TITLE INSURANCE POLICY FOR ACCURACY, EASEMENTS OR EXCEPTIONS.

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www.driesenga.com

FOR SHAW ENVIRONMENTAL

IN NW 1/4 OF SECTION 27 T. 11 N., R. 16 W.

DATE 10-14-04 DRAWN BY MAD / GLK

SHEET

Attachment 7
Documents Reviewed

Landfill Construction Report, Duell and Gardner Landfill Site, Dalton Township, Michigan, IT Corporation, January 3, 2002

Groundwater Treatment System Construction Report, Duell and Gardner Landfill Site, Dalton Township, Michigan, IT Corporation, January 4, 2002

Operation and Maintenance Manual, Duell and Gardner Landfill Site, Dalton Township, Michigan, IT Corporation, January 29, 2002

Landfill Monitoring Plan, Duell and Gardner Landfill Site, Dalton Township, Michigan, IT Corporation, March 4, 2002

2003 Operation and Maintenance Report, Duell and Gardner Landfill Site, Dalton Township, Muskegon County, Michigan, Shaw Environmental & Infrastructure, Inc., September 16, 2004

Groundwater Monitoring Report, December 2004, Duell and Gardner Landfill Site, Dalton Township, Muskegon County, Michigan, Shaw Environmental & Infrastructure, Inc., February 14, 2005

Groundwater Monitoring Report, April 2005, Duell and Gardner Landfill Site, Dalton Township, Muskegon County, Michigan, Shaw Environmental & Infrastructure, Inc., *June 15, 2005*

Record of Decision, EPA, September 7, 1993

Amendment to the Record of Decision, EPA, June 29, 2001

Attachment 8

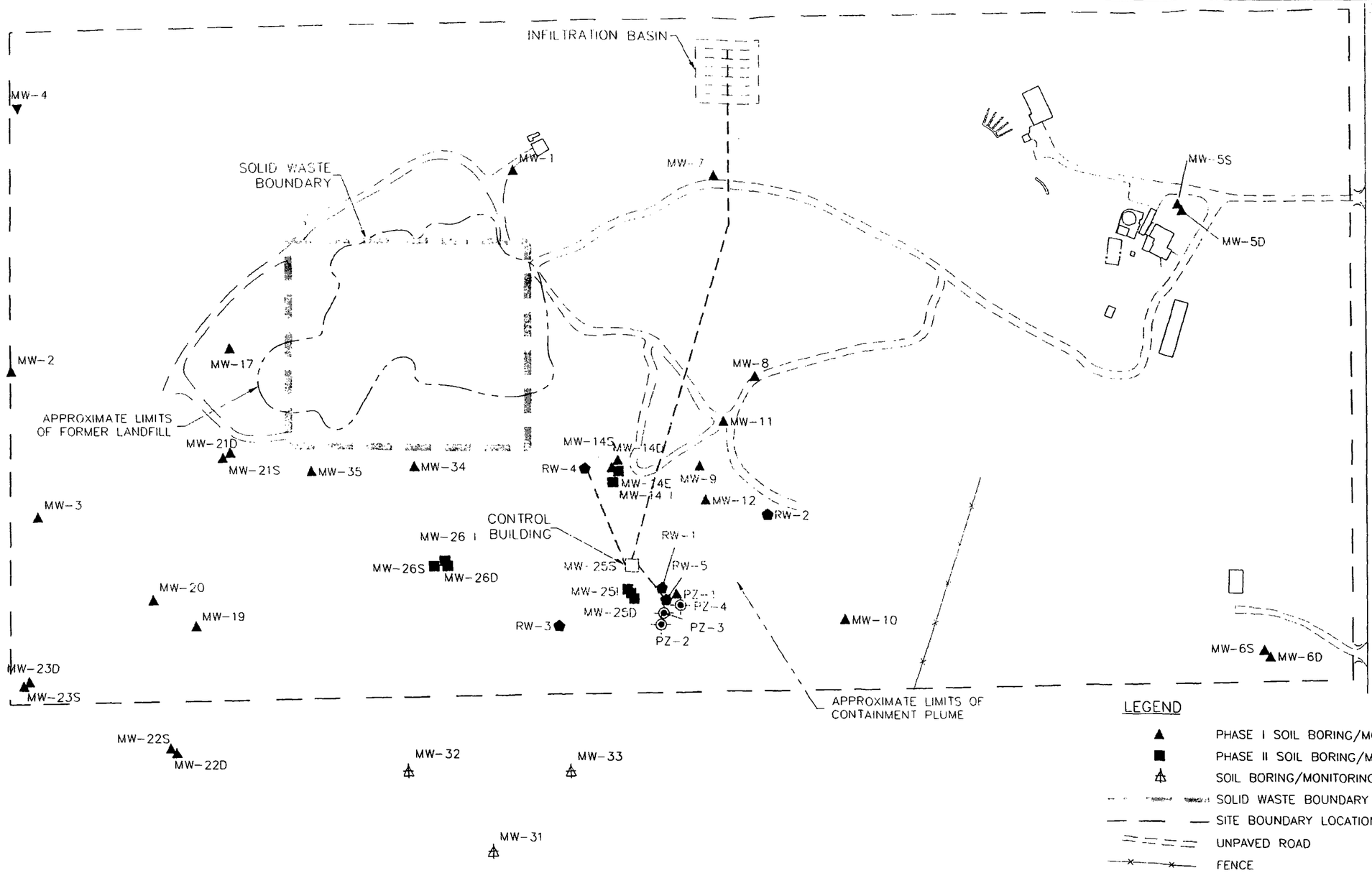
Comparison of ROD Groundwater Target Concentration Limits (TCLs) to Current Michigan Part 201 Residential Drinking Water Criteria					
Chemical	ROD TCLs (ppb)	2004 MI Part 201 Residential Drinking Water Criteria (ppb)	2004 Federal MCL (ppb)	2004 MI Part 201 GSI Criteria (ppb)	Max Concentration Detected in 2004 (ppb)
Carbon Tetrachloride	1	5 A	5	45	9.2
Chloroform	6	80 AW	100	170 X	1.6
Tetrachloroethylene	1	5	5	45 X	ND
N,N-Dimethylaniline	10	16	NA	NA	13
Aniline	6	53	NA	4	ND
Gentian Violet	0.3	15	NA	NA	ND

A - State of Michigan drinking water standard established pursuant to Section 5 of 1976 PA399 MCL 325.1005
W - Concentrations of trihalomethanes shall be added together to determine compliance with Michigan drinking water standard of 80ug/L
X - The GSI criterion shown in the generic cleanup criteria is not protective of surface water used as a drinking water source
NA - Not Available in Part 201 Generic Criteria
ND - Not Detected

Michigan Part 201 Drinking Water and GSI Criteria obtained from MDEQ RRD Operational Memorandum Number 1, dated December 10, 2004: Table 1 Groundwater Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria and Screening Levels, revised June 24, 2005.

Attachment 10

Contaminant Plume Map



File: N:\CADDATA\DWG\Duell-Gardner\103081-2005 GW EVENTS\ProjectDwgs\LVOGSM02.dwg Layout: 2005-8-29-Fig2 User: matthew.boudreau Sep 01, 2005 - 3:22pm

XREF Files: IMAGE Files:

1" 1/2" 0" 1"

Shaw° Environmental, Inc.

MAP MODIFIED FROM EARTH TECH PDI REPORT, NOV 1996 AND ADRIAN BROWN "PROPOSED PUMPING SCHEMATIC", MAY 2001.

DATE 8/29/05
DWN ACE
APP GRS
REV NAM
PROJECT NO. 103081

FIGURE 2
DUELL AND GARDNER LANDFILL
DALTON TOWNSHIP, MICHIGAN

SITE MAP